Federal Aviation Administration – Regulations and Policies
Aviation Rulemaking Advisory Committee

Air Carrier Operations Issue Area
All-Weather Operations Working Group

Task 2 – Review Advisory Circular 120-29A

Task Assignment

Federal Aviation Administration

Aviation Rulemaking Advisory Committee; All-Weather Operations Working Group

AGENCY: Federal Aviation Administration

ACTION: Notice of establishment of All-Weather Operations Working Group .

SUMMARY: Notice is given of the establishment of an All-Weather Operations Working Group by the Aviation Rulemaking Advisory (ARAC). This notice informs the public of the activities of the ARAC.

FOR FURTHER INFORMATION CONTACT: Mr. Quentin J. Smith, Jr., Executive Director for Air Carrier Operations Issues, Flight Standards Service (AFS-200), 800 Independence Ave. SW, Washington, DC, 20591; telephone (202) 267-8166, FAX: (202) 267-5230.

SUPPLEMENTARY INFORMATION: The Federal Aviation Administration (FAA) has established an Aviation Rulemaking Advisory Committee (ARAC) (56 FR 2190, January 22, 1991; and 58 FR 9230, February 19, 1993). One area that the ARAC deals with is air carrier operations. Other working groups in this area have dealt with issues such as autopilot takeoff minimum altitudes, fuel requirements, controlled rest on the flight deck, noise abatement, and flight crewmember flight/rest/duty requirements. The All-Weather Operations Working Group is being established to pursue the elimination of differences between the Joint Aviation Authorities' and the FAA's regulations and advisory materials in areas such as certification criteria and operational authority and

criteria. The All-Weather Working Group will forward recommendations to the ARAC, which will then determine whether to forward them to the FAA.

Specifically, the Working Group's task is as follows:

> To review and revise FAA advisory material associated with the certification and operational approval for all-weather operations, in particular lower weather minimums, in conjunction with the FAA/JAA harmonization work program.
>
> A recommendation in the form of an Advisory Circular, or rulemaking, as appropriate, must be submitted in a format prescribed by the FAA. Other recommendations may be submitted in a format appropriate to the recommendation. All recommendations should be fully justified, and the justification should be submitted as part of the recommendation.

The Working Group should recommend time line(s) for completion of the task, including the rationale, for consideration at the meeting of the ARAC to consider air carrier operations issues held following publication of this notice.

The Working Group will give a status report on the task at each meeting of the ARAC held to consider air carrier operations issues.

The All-Weather Working Group will be comprised of experts from those organizations having an interest in the tasks assigned. A Working Group member need not necessarily be a representative of one of the member organizations of the ARAC. An individual who has expertise in the subject matter and wishes to become a member of the Working Group should write the person listed under the caption **FOR FURTHER**

INFORMATION CONTACT expressing that desire, describing his or her interest in the task, and the expertise he or she would bring to the Working Group. The request will be reviewed with the ARAC Assistant Chair for Air Carrier Operations and the Chair of the All-Weather Working Group, and the individual will be advised whether or not the request can be accommodated.

The Secretary of Transportation has determined that the formation and use of the ARAC are necessary in the public interest in connection with the performance of duties of the FAA by law. Meetings of the ARAC to consider air carrier operations issues will be open to the public except as authorized by section 10(d) of the Federal Advisory Committee Act. Meetings of the All Weather Working Group will not be open to the public except to the extent that individuals with an interest and expertise are selected to participate. No public announcement of Working Group meetings will be made.

Issued in Washington, DC on October 7 , 1994

/s/

Quentin J. Smith, Jr.

Assistant Executive Director

for Air Carrier Operations Issues

Aviation Rulemaking Advisory Committee

Recommendation Letter

AIR LINE PILOTS ASSOCIATION

535 HERNDON PARKWAY ◻ P.O. BOX 1169 ◻ HERNDON, VIRGINIA 20170 ◻ 703-689-2270
FAX 703-689-4370

October 23, 1998

Mr. Thomas E. McSweeny
Associate Administrator for Regulation and Certification
Federal Aviation Administration
800 Independence Avenue, S.W.
Washington, DC 20591

Subject: Advisory Circular 120-29A, Criteria for Approval of Category I and Category II Weather Minima for Approach

Dear Mr. McSweeny:

The Aviation Rulemaking Advisory Committee Air Carrier Operations Issues Group has been discussing, among other things, revision of Advisory Circular (AC) 120-29A, Criteria for Approval of Category I and Category II Weather Minima for Approach. Attached is the latest version of their efforts in this regard.

The Issues Group discussed this draft revision at our last meeting. We consider it to be ready for publication for public comment in the Federal Register. The working group is available to assist in any further manner necessary to get the AC approved as a final document.

Thank you for the opportunity to assist in this important issue.

Sincerely,

William W. Edmunds Jr.

William W. Edmunds, Jr.
Assistant Chairman
Aviation Rulemaking Advisory Committee

WWE:ye
attachment

cc: Air Carrier Operations Issues Group

Acknowledgement Letter

U.S. Department
of Transportation
**Federal Aviation
Administration**

800 Independence Ave., S.W.
Washington, D.C. 20591

JUN - 9 1998

Mr. William W. Edmunds, Jr.
Air Line Pilots Association
P.O. Box 1169
Herndon, VA 20170

Dear Mr. Edmunds:

We have received your December 15 transmittal forwarding the draft Advisory Circular (AC) 120-28D, Criteria for Approval of Category III Weather Minima for Takeoff, Landing, and Rollout. This is a monumental document in terms of detail and coverage, and I commend the working group for its perseverance and dedication in accomplishing the development and harmonization of the draft AC.

I note that you have forwarded the draft document for further Federal Aviation Administration (FAA)action, including publication, and eventual approval as a final document. The FAA considers that the draft AC is here for review, as required by ARAC procedures. However, because the document is under review, the FAA has determined that it is in the best interest to publish a notice of availability in the Federal Register and seek public comment on the document now. That notice of availability was published on May 21.

I very much appreciate the time and personal dedication of the working group in this accomplishment. The FAA looks forward to working with them to finalize the advisory circular.

I offer my special thanks for your continued and excellent support of the Aviation Rulemaking Advisory Committee.

Sincerely,

Margaret Gilligan

Guy S. Gardner
Associate Administrator
for Regulation and Certification

Recommendation

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(RESERVED)

1. PURPOSE. This advisory circular (AC) provides an acceptable means, but not the only means, for obtaining and maintaining approval of Category I and II Weather Minima including the installation and approval of associated aircraft systems. This AC is applicable to Title 14 of the Code of Federal Regulations (14 CFR) parts 121, 135, and those part 125 operators not exempted under section 125.1 or not having received an applicable deviation authorization under Section 125.3. Certain aspects of this AC are applicable to 14 CFR part 129 operators. Many of the principles, concepts and procedures described also may apply to 14 CFR part 91 operations and are recommended for use by those operators when applicable. Mandatory terms used in this AC as shall or must are used only in the sense of insuring applicability of these particular methods of compliance when the acceptable means of compliance described herein is used. This AC does not change, add or delete regulatory requirements or authorize deviations from regulatory requirements.

AC 120-29, dated December 3, 1974, is canceled.

2. RELATED REFERENCES AND DEFINITIONS.

2.1. Related References.

14 CFR part 91, sections 91.175, and 91.189; 14 CFR part 121, sections 121.579, and 121.651; 14 CFR part 125, sections 125.379, and 125.381; 14 CFR part 129, section 129.11; and 14 CFR part 135, section 135.225.

Current editions of the following ACs: AC 120-28, AC 120-CNS

Standard Operations Specifications (OpSpecs) Part A and C and FAA Orders 8400.8, 8400.10, and 8400.13

2.2. Definitions. A comprehensive set of definitions pertinent to Category I and II is included in Appendix I.

3. BACKGROUND.

3.1. Major Changes Addressed in this Revision. This circular includes additional Category I and Category II criteria or revised Category II criteria for use of Head-up Displays, use of Required Navigation Performance (RNP), satellite navigation sensors, and "engine inoperative" Category II.

This circular also clarifies existing criteria to address frequently asked questions.

This revision incorporates changes resulting from the first steps toward international all weather operations (AWO) criteria harmonization taken by the FAA, European JAA, and several other regulatory authorities. Subsequent revisions of this AC are planned as additional all weather operations harmonization items (AHI(s)) are agreed and completed by FAA and JAA, or internationally.

3.2. Relationship of Operational Authorizations for Category I or Category II and Airborne System Demonstrations. Approach weather minima are approved through applicable operating rules, use of approved instrument procedures and issuance of OpSpecs. Airworthiness demonstration of aircraft equipment is usually accomplished in support of operational authorizations on a one time basis at the time of Type Certification (TC) or Supplemental Type Certification (STC). This demonstration is based upon the airworthiness criteria in place at that time. Since operating rules continuously apply over time and may change after airworthiness demonstrations are conducted, or may be updated consistent with safety experience, additional Category I or Category II credit or constraints may apply to operators or aircraft as necessary for safe operations. In general, criteria related to operational approval is contained in the main body of this AC and criteria related primarily to the airworthiness demonstration of systems or equipment is included in the appendices to this AC.

3.3. Applicable Criteria. AC 120-29, dated December 3, 1974, is canceled. Except as described below, new airworthiness demonstrations or operational authorizations should use the criteria of AC 120-29A. Airworthiness demonstrations may use equivalent JAA criteria where agreed by FAA through the FAA/JAA criteria harmonization process. Operators electing to comply with these revised criteria may receive additional credit when using the revised criteria. Aircraft manufacturers or modifiers may elect to demonstrate their aircraft using the revised criteria to seek credit for additional operations. Aircraft demonstrated using earlier criteria may continue to be approved for Category I or

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Category II operations in accordance with that earlier criteria. Aircraft or operators seeking additional credit provided for in this AC must, however, use the criteria of this AC for that credit.

4. OPERATIONAL CONCEPTS.

4.1. Classification and Applicability of Minima. Landing minima are generally classified by Category I, Category II and Category III. Definitions for Category I, II, and III are specified by ICAO, and are included in Appendix I of this AC. This AC addresses criteria for Category I and Category II operations. AC 120-28 (as amended) addresses takeoff in low visibility conditions and Category III Landing operations.

Landing minima are generally addressed by sections 91.175, 121.649, 121.651, 121.652 and standard or special OpSpecs Part C. Application of these definitions of Category I, II, and III to landing is discussed in section 4.3.1 below.

Although a wide variety of normal and non-normal situations are considered in the design and approval of systems and procedures for Category I and Category II, landing weather minima are primarily intended to apply to normal operations. For non-normal operations, flightcrews are expected to take the safest course of action appropriate for the situation, notwithstanding landing weather minima. When aircraft systems have been demonstrated to account for certain non-normal configurations and a procedure is specified (e.g., an approach with an engine inoperative non-normal procedure) flightcrew may take account of this information in assessing the safest course of action. In addition, when inoperative aircraft systems have been accounted for in the AFM as an alternate configuration using criteria of this AC (e.g., an approach with an engine inoperative is specified as a demonstrated configuration) operational credit for that configuration (alternate minima credit) may be authorized.

Takeoff minimums are generally addressed by section 91, 121, 135 and standard or special OpSpecs. Application of takeoff minima is discussed in section 4.2 below.

4.2. Takeoff.

a. Takeoff Minima. Takeoff minima are addressed by sections 91.175(f), 121.649, 121.651, 135.225, and standard or special OpSpecs Part C. The authority for lower than standard takeoff minimums is contained in Sections 135.225(h)(3) and 121.651(a)(1).

Operations Specifications are applicable to part 121 and 135 operators and certain other operators (e.g., part 125 and part 129). Where minima lower than that provided in standard OpSpecs are necessary, applicable criteria for use of those minima are specified in AC 120-28D. When appropriate, principal operations inspectors (POI(s)) issue OpSpecs specifying the lower minima through paragraph C056 for part 121 operators and OpSpecs paragraph C057 for Part 135 operators. OpSpecs contain specific guidance regarding pilots, aircraft, and airports when lower than standard takeoff minimums are used.

b. Visibility Assessment and RVR Equivalence.

1) Reported RVR equivalent value for met visibility minima. For takeoff procedures where minima are expressed in terms of RVR, but visibility is reported as a meteorological visibility, the "visibility-RVR" equivalence table referenced in Standard OpSpecs may be used to establish equivalent RVR (see Appendix 7, OpSpec Paragraph C051).

2) Reported meteorological visibility equivalent value for RVR minima. Conversely, for takeoff procedures where minima are expressed in terms of RVR, but reported visibility available to the flightcrew is specified as a meteorological visibility, the "Visibility-RVR Equivalence" table referenced in Standard OpSpecs may be used to establish equivalent RVR (see Appendix 7, OpSpec Paragraph C051).

3) Pilot Assessment of equivalent RVR. For takeoff circumstances where Touchdown Zone RVR is inoperative or is determined by the pilot to be significantly in error (e.g., patchy fog obscuring a transmissometer but not the runway, snow

on transmissometer causing erroneous readings) a pilot assessment may be made in lieu of RVR (see Appendix 7, OpSpec Paragraph C056).

To be eligible to use this provision the operator must assure that each pilot authorized to make this determination has completed approved training addressing pilot procedures to be used for visibility assessment in lieu of RVR, and the pilot can determine the necessary runway markings or runway lighting that must be available to provide an equivalent RVR to that specified to assure adequate visual reference for the takeoff.

When any pilot assessment of equivalent RVR is made, the pilot must be able to positively determine position on the airport and correct runway, and positively establish that the aircraft is at the correct position for initiation of takeoff. Typically this equivalent RVR assessment is applicable only at a runway threshold where runway identifying markings and number(s) are visible from the takeoff position (e.g., not applicable to intersection takeoffs).

4.3. Landing.

4.3.1. Approach and Landing Concepts and Objectives. Landing minima are classified as Category I, Category II, and Category III. Definitions of these categories are provided in Standard OpSpecs Part A paragraph A2, and in Appendix 1 of this AC. While generally consistent with ICAO definitions, the definitions used in Standard OpSpecs, where different from ICAO, apply and take precedence for United States (U.S.) Operators, or for international operators conducting operations within the U.S., or at U.S. facilities.

For U.S. operators, any instrument approach with a DA (H) or MDA (H) and visibility above that specified in OpSpecs for Category I, (see Appendix 7) is considered to be a Category I operation (e.g., an approach with either a DA (H) or an MDA (H) which is greater than 200' HAT and visibility greater than 1800 RVR is considered to be Category I, even though it may be based on a NAVAID other than ILS).

Any instrument approach with a DA (H) or visibility less than that specified for Category I, but above that specified in for Category II, is considered to be a Category II operation.

Any instrument approach with a DA (H) less than that specified for Category II (or with no DA (H) or with an Alert Height), or with a visibility less than that specified for Category II, in accordance with applicable OpSpecs is considered to be a Category III operation.

Category I operations are typically conducted manually using raw data information, by reference to flight guidance displays (flight directors), or automatically using approved autopilot or autoland systems.

For Category I, basic airworthiness certification for IFR under provisions of 14 CFR part 25 typically is considered an acceptable means of demonstration of capability for operational acceptance of an aircraft and it's associated systems. Specific criteria for airworthiness demonstration of certain specific systems or capabilities for Category I are included in Appendix 2 (e.g., FMS or RNP).

For Category I minima, it is expected that for non-normal operations (e.g., engine(s) inoperative, hydraulic or electrical system(s) failure) the pilot or operator should consider any necessary adjustment of operating minima, wind limit constraints, or other factors to assure safe operation with the non-normal condition.

Category II operations may be conducted manually using flight guidance (e.g., flight director) displays. However, most Category II operations are conducted using an autopilot or autoland system, or with combinations of systems using both automatic and flight guidance (e.g., flight director) elements. Additional demonstration or operational assessment beyond that required for basic IFR flight under provisions of basic aircraft 14 CFR part 25 type certification typically is necessary for operational authorization of an aircraft for Category II (see Section 5 and Appendix 3). Specific criteria for airworthiness demonstration of systems or capabilities for Category II are included in Appendix 3 (e.g., for flight director(s), autopilot(s), or HUD) for cases where an applicant seeks prior credit for such an airworthiness demonstration in the airplane flight manual (AFM).

For Category II minima, certain non-normal conditions are typically considered in the assessment and authorization process. Response to those non-normal conditions may be explicitly defined in the Category II authorization (e.g., engine failure, electrical component failure, or engine inoperative Category II). For failures other than those addressed by the Category II authorization, the pilot or operator may need to adjust the operating minima used, introduce wind limit constraints, or address other factors to assure safe operation for the particular non-normal condition.

4.3.1.1. Operational Safety Evaluation. For any instrument approach, using either Category I or Category II minima, the operator must adequately consider and provide for safe operations considering at least the following:

1) The possibility of a failure of any one of the pertinent navigation system, flight guidance system, flight instrument system, or annunciation system elements used for the approach or missed approach (e.g., ILS receiver failure, Autopilot disconnect, etc.),

2) The possibility of a "probable" failure of the aircraft or related supporting systems during the approach or missed approach (e.g., engine failure, electrical generator failure),

3) The possibility of a balked landing or rejected landing at or below DA (H), or MDA(H), as applicable,

4) The possibility of loss or significant reduction of visual reference, that may result in or require a go-around,

5) Suitable obstacle clearance following a missed approach, considering applicable aircraft configuration during approach and any configuration changes associated with a go-around (e.g., engine failure, flap retraction).

6) For special airports identified in accordance with section 121.445 (e.g., mountainous terrain), or other airports with critical obstacles that have not otherwise been accounted for, the ability to assure suitable obstacle clearance following a rejected landing; applicable aircraft configuration(s) during approach and any configuration changes associated with a go-around and missed approach should be considered.

7) Unusual atmospheric or environmental conditions that could adversely affect the safety of the operation (e.g., extreme cold temperatures, known local atmospheric or weather phenomena that introduce undue risk, etc.).

When in conducting a safety assessment of issues listed above and uncertainty exists as to aircraft failure condition effects, procedural design intent or margins, aircraft characteristics or capabilities following failure, or other such issues, the operator should consult with the aircraft manufacturer, avionics manufacturer, procedure designer, air traffic authority, or regulatory authority as applicable and as necessary to assure use of comprehensive and accurate information.

4.3.1.2. Primary and Supplementary Means of Navigation and Required Navigation Performance (RNP).

"Primary" and "Supplementary" means of navigation and Required Navigation Performance (RNP) are as defined in Appendix 1. Application of these terms to instrument approach or takeoff are as described below.

a. Primary Means of Navigation. A "Primary Means" of navigation is a means of navigation that satisfies each of the necessary levels of accuracy, integrity, and availability for a particular area, route, procedure or operation. The failure of a "Primary Means" of navigation may result in, or require reversion to a "non-normal" means of navigation or alternate level of RNP.

As applicable to instrument approach operations for an air carrier, particularly for a final approach segment or a missed approach segment, the following may be considered to satisfy requirements for a primary means of navigation.

For sensor specific approaches (e.g., VOR, or NDB, or ILS) each particular airborne system using its respective associated NAVAID (e.g., ILS) may be considered as the "primary means of navigation" for completion of that respective specified approach procedure (e.g., ILS RWY 16R).

When multiple components are required (e.g., ILS, with use of an NDB for the missed approach), the collective set of specified navigation components are considered to be the primary means of navigation for that procedure. Failure of any one of the required components may preclude use of the procedure, or may require reversion to a non-normal means of navigation for completion of the procedure (e.g., failure of the NDB missed approach NAVAID associated with an ILS approach).

For RNAV based procedures where the only method of flying the procedure is by an RNAV or RNAV/RNP system (e.g., FMS), RNAV is considered to be the primary means of navigation for that approach procedure. Any associated NAVAID, or combinations of NAVAIDs, or airborne sensors necessary to achieve the necessary level of FMS performance may be considered as an input sensor(s) to the FMS, but the sensors or NAVAIDs taken alone are not necessarily considered to be the primary means of navigation.

Where RNAV systems are used to overfly other types of instrument approach procedures (e.g., FMS RNAV systems overflying flying VOR or NDB procedures), the RNAV system may be considered as a supplemental system if the aircraft can revert to use of the underlying procedure flown with "raw data", in the event of failure of the RNAV system (see b. below).

b. Supplementary Means of Navigation. A "Supplementary Means" of navigation is a means of navigation which satisfies one or more, but not necessarily all of the necessary levels of accuracy, integrity, and availability for a particular area, route, procedure or operation. The failure of a "Supplementary Means" of navigation may result in, or require reversion to another alternate "normal" means of navigation for the intended route procedure or operation.

As applicable to instrument approach operations for an air carrier, particularly for a final approach segment or a missed approach segment, the following may be considered to satisfy requirements for a supplementary means of navigation.

When procedures have multiple methods to achieve compliance (e.g., a multi-sensor FMS overflying a VOR approach, or an ILS approach with the choice of either an NDB or a VOR based missed approach), those airborne systems which have another alternate normal means to accomplish the procedure, or a portion of the procedure, for one or more applicable segments, may be considered as supplementary for those applicable segments (e.g., if the FMS should fail, and the crew is monitoring the underlying VOR information, and the crew can transition to use of VOR based navigation) the FMS may be considered as supplementary.

Or, if after an ILS approach, FMS RNAV capability is used to overfly a VOR/DME based missed approach (with VOR/DME NAVAID facilities operating), the FMS RNAV capability may be considered supplementary. Note however, that if the specified approach/missed approach VOR/DME NAVAIDs are not operative, and the FMS RNAV operation is based on use of multi-sensor NAVAID capability, then the FMS use for that approach/missed approach would typically considered a primary means of navigation.

c. Required Navigation Performance (RNP). Required Navigation Performance is a statement of the navigation performance necessary for operation within a defined airspace (Adapted from ICAO - IS&RP Annex 6). Required Navigation Performance is specified in terms of accuracy, integrity, and availability of navigation signals and equipment for a particular airspace, route, procedure or operation.

4.3.1.3. Use of ICAO Standard NAVAIDs. U.S. Category I or Category II Operations are based on use of ICAO standard NAVAIDs, equivalent NAVAIDs, or other NAVAIDs acceptable to FAA and approved in OpSpecs. Authorization for use of NAVAIDs other than ICAO Standard NAVAIDs must be coordinated with AFS-400.

A Standard Landing Aid (SLA) in the context of this section of this AC, is considered to be a navigation service provided by a State which meets internationally accepted performance standards (e.g., ICAO Standards and Recommended Practices (SARP(s)), equivalent State standards found to be acceptable by FAA, or U.S. standards

4.3.1.4. Standard Instrument Approach Procedures (SIAPS).

a. Instrument approach procedures used by operators in accordance with this AC should be based on:

1) U.S. Standard Instrument Approach Procedures,

2) For non-U.S. airports, foreign instrument approach procedures acceptable to FAA promulgated by the state of the airport of landing (i.e. ICAO - State of the Aerodrome),

3) Military instrument procedures acceptable to FAA for operations at military facilities,

4) Special instrument approach procedures developed by the FAA,

5) Special instrument approach procedures developed by the operator which are acceptable to FAA, or procedures developed by the operator using methods acceptable to FAA, or

6) Special instrument approach procedures acceptable to FAA developed other U.S. or non-U.S. operators, or by the State of the Aerodrome (for foreign airports).

b. For procedures other than those developed in accordance with FAA Order 8260.3 Standards for Terminal Instrument Procedures (as amended), the operator must assure consideration of at least the following factors related to use of those instrument procedures:

1) Availability of suitable weather reporting and forecasts,

2) Identification of any necessary alternates airports or alternate minima,

3) Ability to discontinue an approach, if necessary, from any point to touchdown (extraction),

4) Suitability of the airborne equipment to use the procedure (e.g., compatibility of the airborne equipment with the type/characteristics of the ILS, VOR, DME, NDB ground facilities used),

5) Suitability of Ground Systems/Equipment (e.g., lighting, transmissometers, pilot control of lighting),

6) Suitability of NAVAIDs (e.g., maintenance, monitoring),

7) Suitability of Airport/Runway (e.g., obstructions, clear zones, markings),

8) Availability of Aeronautical Information (e.g., timely NOTAM availability),

9) Identification of any special Training or qualification related to the procedure, and

10) Resolution of any issues identified from adverse "service experience" with the procedure.

c. Special instrument approach procedures other than those developed by FAA should be coordinated with the Flight Standards Division (e.g., flight procedures specialist) of the FAA region having responsibility for the airport of the procedure. Special procedures should address any provisions associated with application of section 121.445 for special airport qualification. Special procedures are approved by the POI after coordination with pertinent FAA organizations. Special procedures other than those based on criteria described in FAA Order 8260.3 as amended, Order 7100.11 as amended, or Order 8260.40 as amended should be coordinated with AFS-400 prior to POI approval.

4.3.1.5. "Steep Approaches" and Approach Path Descent Angle Constraints. Approach path angles between 2.75 degrees and 3.77 degrees are considered standard for air carrier operations. Approach angles above 3.77 degrees are considered "steep angle" and, if authorized, may require additional assessment. Air carrier use of approach angles over 3.77 degrees should be coordinated with AFS-400. Approach angles over 4.5 degrees should be predicated on associated aircraft type AFM provisions for steep angle approaches in accordance with AC 25-7 and Appendix 2 section 6.8.

4.3.1.6. "Normal Maneuvering" Considerations. Section 91.175 requires that approach procedures (including procedures for either Category I or II) should be predicated on use of "normal maneuvers" before and after passing DA (H) or MDA (H). Normal maneuvers typically do not involve use of bank angles greater than 30 degrees, pitch attitudes in excess of 25 degrees nose up or 10 degrees nose down, or sink rates in excess of 1100 feet per minute below 500 feet HAT while maneuvering to land within the touchdown zone, during go-around, or during a rejected landing. During a missed approach, pitch attitudes are normally considered to be less than +30 degrees and bank angles are normally less than or equal to 30 degrees.

4.3.1.7. Non-Normal Events or Configurations. Takeoff and landing weather minimums are intended for normal operations. When non-normal events occur, flightcrews are expected to take the safest course of action to assure safe completion of the flight. Using emergency authority, crews may deviate from rules or polices, to the extent necessary, to minimize the risk of continued flight to a safe landing.

Section 6.1.8 addresses guidelines and procedures to be considered in conducting an instrument approach during a non-normal event.

4.3.1.8. Go-Around Safety.

a. An aircraft conducting an instrument approach (either Category I or Category II) should be capable of safely executing a go-around from any point in an approach prior to touchdown with the aircraft in a normal configuration, or specified non-normal configuration (e.g., engine out if applicable). It is necessary to provide for go-around due to aircraft related or Air Traffic Service contingencies, rejected landings, loss of visual reference, or missed approaches due to other reasons.

b. An operator must have sufficient performance information to determine and assure, as necessary, obstacle clearance following a go-around or balked landing climb from both an approach and the runway environment.

c. Simplified methods accounting only for transition and reconfiguration and acceleration distance based on use of otherwise required allowable takeoff gross weight (ATOGW) data for takeoff on that same runway are acceptable. If a simplified method is used, such a method must account for:

1) Actual go-around configuration transitions from approach to missed approach configuration including flap settings and flap retraction,
2) Speed changes,
3) Engine failure and shutdown (feathering if applicable) provisions,
4) Any lateral differences in flight path, and
5) Balked landing obstacle clearance until reaching missed approach or enroute procedurally protected airspace.

d. If data is developed or an obstacle clearance determination or demonstration is conducted by the operator, aircraft manufacturer, or a procedural consultant, for the purposes of this determination, the data may assume the following initial conditions:

1) A "balked landing" starts at the end of the TDZ.
2) An engine failure occurs at the initiation of the balked landing, from an all-engine configuration.
3) Balked landing initiation speed $\geq$ Vref or Vga (as applicable).
4) Balked Landing initiation height is equal to the specified elevation of the TDZ.
5) Balked landing initiation configuration is normal landing flaps, gear down.
6) At the initiation of the maneuver, all engines are at least in a spooled configuration.

e. The operator must be able to determine either the weight at which a given critical obstacle height may be cleared at a given longitudinal distance from the initiation of the balked landing (end of TDZ); or at a given weight, must be able to determine the height that may be cleared at a given distance from the initiation of the balked landing climb (end of TDZ), considering the airport elevation and temperature at the airport elevation, and appropriate configuration transitions.

f. Necessary data may be provided in a form similar to that provided for takeoff, or in a different form, as long as the operator can determine and assure the necessary obstacle clearance following the go-around and during the subsequent balked landing climb and missed approach. The operator should be able to account for:

1) Any necessary reconfiguration of the aircraft from a landing configuration to a go-around configuration, including flap retraction if applicable, and landing gear retraction,
2) Longitudinal distance and obstacle clearance height achievable during acceleration, to Vga, and subsequently achieving a steady-state climb gradient, as necessary,
3) Any performance or gradient loss during turning flight, if necessary to follow a flight path that is not over the runway or is not aligned with the runway after the balked landing transition,
4) Transition between any flap settings intended to be used for approach and missed approach,
5) Any obstacle height or longitudinal distance of an obstacle or gross weight up to the maximum authorized for takeoff applicable to that operator, aircraft type, and runway.

g. Data may be based on or use methods otherwise used for takeoff such as "Overspeed V2", "engine-out maximum angle climb gradient" instead of "maximum rate" climb gradient, or other such techniques if they are determined to be safe by the operator, aircraft manufacturer, and CHDO.

h. Performance data provided should be consistent with any applicable flight guidance system or operational procedures used. Any techniques required to achieve the specified performance should be provided to the flight crew.

i. As necessary, the same lateral and vertical flight path obstacle clearance assumptions may be made as applied to corresponding takeoff flight paths (e.g. FAR 121.189) in the determination of net vertical flight path clearance or lateral track definition or lateral track obstacle clearance within an airport boundary or beyond an airport boundary until the point at which cruise or other obstacle clearance requirements apply.

j. Compliance with TERPS or PANS-OPS requirements alone, particularly for two-engine aircraft which achieve gradients with an engine inoperative that may be less than TERPS or PANS-OPS gradients, does not ensure obstacle clearance or safety of a balked landing and subsequent missed approach. This is true whether a go-around is initiated from DA (H), MDA (H), on a circling approach, or from the end of the TDZ when below DA (H) or MDA (H).

k. Since the collision risk model (CRM) used with TERPS and PANS-OPS is a statistical technique which does not assure obstacle impingement, use of collision risk models are not an acceptable means to assure compliance with FAR 121.189 for takeoff, or for a similar analysis for missed approach with an engine inoperative.

l. It is important to note that TERPS or PANS-OPS are intended only to provide probabilistically determined protection for normal "operations" which are considered "standard" (e.g. standard procedures based on all-engine performance, not even "special" procedures based on all-engine, and no engine inoperative procedures whether standard or special). These references are not intended to address non-normal situations and events, such as engine failure for which deterministic compliance is required by the all weather operations and performance operating rules.

m. RNP-based procedures and criteria intrinsically provide for appropriate balked landing and missed approach obstacle protection in their construction.

n. As an alternate acceptable method, the operator may provide data for a longitudinal distance "D" from a worst case balked landing at the end of the touchdown zone to the point where a known acceptable stabilized climb rate is established. Air Carriers may add "D" distance to the 3000 feet point to identify the distance covered to establish an appropriate steady climb gradient, then use the climb gradient to confirm obstacle clearance.

o. FGS Systems must be demonstrated to be compatible with obstacle analysis, transitions, and gradient determinations. This may be achieved by demonstrating a safe go-around from 100 feet HAT operationally, or as part of an airworthiness demonstration conducted in accordance with Appendix 2 or 3 or AC120-28D. There is no requirement for height loss information to be provided by the operator or manufacturer in the FCOM or AFM.

p. Appendix 3 Section 9 addresses data availability from an aircraft manufacturer available to support climb gradient, maximum weight, or transition distance assessments for balked landing or missed approach obstacle clearance assurance. In the event such data is not available from the aircraft manufacturer, the operator may, as necessary, develop, compute,

demonstrate or determine such information to the extent necessary to assure safe obstacle clearance during an engine-out missed approach or engine-failure following a rejected landing.

q. Section 5.14 describes typical factors to be considered when assessing go-around capability for a particular aircraft and flight guidance system type. Section 6 addresses procedures including those used for go-around or rejected landing, and Section 7 addresses flightcrew Training and Qualification including relevant aspects of missed approach, go-around, or rejected landing.

4.3.2. ILS, GLS, or MLS (xLS) Instrument Approach Operations. ILS, GLS, or MLS (e.g., xLS) operations may be authorized to the lowest applicable DA (H) for the procedure used, and to the lowest visibility minima specified in the OpSpecs for the NAVAID, facilities, and lighting systems used (see Appendix 7, Standard OpSpecs Part C Paragraph C053 for Category I, and Standard OpSpecs Part C paragraph C059 for Category II).

ILS, GLS, or MLS (e.g., xLS) operations are typically authorized based on use of two or more navigation receivers or multi-mode receivers (MMRs) of a pertinent type (see section14 CFR, part 121, section 121.349, and part 125 section 125.203), each providing independent information to the appropriate flight guidance system elements and pilot displays.

Provisions of sections 121.349, and 125.203 applicable to ILS may also be considered as applicable to GLS or MLS.

Provisions of section 121.349 for use of a single navigation (e.g., ILS) receiver are typically limited to operations using minima at or above RVR4000 or for Minimum Equipment List (MEL) authorization of a NAVAID receiver inoperative dispatch.

Precision Approach Radar (PAR) procedures are not considered xLS procedures. For PAR procedures, see section 4.3.3.

4.3.3. Instrument Approaches other than ILS, GLS, or MLS. Instrument approach procedures other than ILS, GLS, or MLS that may be authorized include the following.

a. Standard Landing Aid (SLA) Approaches. NAVAID specific procedures using a standard landing aid (SLA), without vertical guidance (e.g., non-precision approaches) as follows:

- Localizer (LOC),
- Localizer Back Course (BC)
- Localizer Back Course with Glide Slope,
- VOR,
- VOR/DME,
- NDB,
- Dual NDB,
- NDB/DME,
- TACAN, and
- RNAV (Limited - 2D) based on a procedurally specified, particular standard landing aid/NAVAID (e.g., a particular VOR/DME to the procedure).

b. Standard Landing Aid (SLA) Approaches with Vertical guidance (VNAV). NAVAID specific procedures using a standard landing aid (SLA) with vertical guidance (e.g., procedures listed in a. above, but which are flown using a specified path for vertical guidance).

> **Note: NAVAID specific procedures flown using an "open loop" vertical speed based descent profile, with a periodic altitude/distance crosscheck, are not considered to have vertical guidance.**

c. RNAV Procedures (3D or 2D). RNAV Procedures (3D or 2D), but not necessarily based on particular standard landing aids (SLAs) or NAVAIDs (e.g., may be based on applicable FMS determined DMD-DME position updating, VOR/DME updating, or GNSS, and which usually also considers 2 or more IRSs in the position determination).

d. RNAV/RNP Procedures (3D or 2D). RNAV procedures (typically 3D) as noted in c. above, but which include RNP based minima, or which are exclusively flown using RNP, or have RNP in the procedure title (e.g., RNP.15 RW28L).

e. Airport Surveillance Radar (ASR) Procedures.

f. Precision Approach Radar (PAR) procedures.

g. Other Limited Use Special Procedures. Other special instrument approach procedures (e.g., LORAN, Transponder Landing System (TLS), airborne radar approach, Eastern European KRM).

Special procedures include use of LORAN C, airborne radar, or any other landing system or non-ICAO NAVAID. Special procedures typically require unique approval of an operator's operational procedures, flightcrew qualification, and maintenance programs as well as proof of concept demonstration prior to operational authorization. Special Category I operations, by definition, require the use of airborne and/or ground based or spaced equipment over and above the minimum equipment necessary to operate in the U.S. national airspace. Special Category I operations usually also require special knowledge, skills, proficiency, and procedures. As a result, changes and amendments to the operator's overall Category I operations program are usually necessary to ensure safe conduct of these operations. There is additional criteria which must be incorporated into an operator's program for special Category I operations.

4.3.4. Applicability of a DA (H) or MDA (H). Instrument approach and landing operations have limitations related to the minimum altitude (height) to which descent can be made without establishing visual reference (e.g., 14 CFR part 91, Section 91.175). Minimum altitude or height to which descent can be made is typically related to assurance of clearance over terrain or obstacles, airborne instrumentation and equipment, NAVAIDs, and visual aids. Minimum height or altitude is usually specified as a DA (H) or MDA (H) and is used for various instrument approach procedures as described in sections 4.3.4.1 through 4.3.4.3.

Other expressions of minima may be used internationally. The U.S. equivalent minima to be used is described below for various types of approaches:

a. DA, DH, OCA, OCL. For xLS Approaches, the minimum height or altitude for instrument flight is specified as a DA (H) in the U.S. and many other countries. However, it may also be expressed as a decision altitude (DA), obstacle clearance altitude (OCA), decision height (DH), obstacle clearance height (OCH), or obstacle clearance limit (OCL). In the U.S, and other countries that use U.S. TERPS criteria, the minimum instrument flight altitude for precision approaches is considered to be the DA value of the DA (H) if minima are based on a barometric altimeter, or the DH value if based on a radio (radar) altimeter. For a barometrically specified DA (H) minima, the associated height value in parenthesis is considered to be advisory. For a radio altitude based minima the DH height value of a DA (H) is considered controlling and the barometric altitude value is advisory. A DA is specified as a decision altitude referenced to mean sea level (MSL) for QNH altimeter settings. A DA is specified in terms of HAT for aircraft using a QFE barometric altimeter setting. OCH and OCL are used some countries in accordance with various revisions of ICAO PANS-OPS. OCA, where used, is referenced to a barometric altitude (MSL). OCH and OCL are referenced to a radio or radar height above either the elevation of the airport, the elevation of the touchdown zone, or the elevation of the landing threshold.

b. MDA, MDH, HAT, HAA, OCA, OCH, OCL. For Approaches other than xLS (e.g., non-precision approaches), the minimum height or altitude may be specified as a decision altitude DA of a DA (H) if suitable vertical guidance is provided (e.g., VNAV path), or specified as a minimum descent altitude MDA of a MDA (H) if vertical guidance is not provided. Minima may also be specified height above touchdown (HAT), height above airport (HAA), minimum descent height (MDH), obstacle clearance altitude (OCA), obstacle clearance height (OCH), or obstacle clearance limit (OCL). MDA, HAT, and HAA are typically used by certain countries that use various earlier versions of U.S. TERPS criteria. OCA, OCH, and OCL are used in countries having procedures established in accordance with ICAO PANS-OPS. Although ICAO PANS-OPS now does not use OCL, some procedures still use OCL criteria from previous versions of PANS-OPS. Some countries, in addition to OCA and OCH, provide MDA and MDH. MDA and OCA are barometric flight altitudes referenced to mean sea level (MSL). HAT, HAA, MDH, OCH, and OCL are radio or radar altitudes referenced to either the elevation of the airport, the elevation of the touchdown zone, or the elevation of the landing threshold.

Accordingly, for international operations, the following equivalent minima formulations should be used by U.S. Operators:

(1) Use the altitude value of the MDA (H) where OCA may be specified for procedures other than xLS.

(2) Use the equivalent altitude value of the MDA (H) where HAT, OCH, or OCL are specified for "straight-in" approach procedures.

(3) Use the equivalent altitude value of the MDA (H) where HAA, OCH, or OCL may be specified circling approach maneuvers.

c. Lowest Permissible DA (H) or MDA (H). The lowest permissible DA (H) or MDA (H) for instrument flight (IMC) for any approach should not be lower than the most restrictive of the following, as applicable:

- Minimum height or altitude published or otherwise established for the instrument approach,
- Minimum height or altitude authorized in OpSpecs for the approach,
- Minimum height or altitude authorized for the flightcrew,
- Minimum height or altitude authorized for the operator, aircraft, and airborne equipment,
- Minimum height or altitude permitted by operative airborne equipment and NAVAIDs,
- Minimum height or altitude for which required NAVAIDs can be relied upon*,
- Minimum height or altitude which provides adequate obstacle clearance*, and
- Minimum altitude which provides compensation for extremely cold temperatures, if applicable**.

***Note: Item normally addressed by the published instrument approach procedure**

****Note: Applicable only when an operator has a procedure to correct altimeter errors for extremely cold temperatures (Typically T less than -22F/-30C).**

4.3.4.1. Application of a Decision Altitude (Height) [DA (H)] for Category I. Procedures established based on use of NAVAID electronic vertical guidance (e.g., ILS, GLS or MLS glideslope) use the barometrically based DA (of the specified DA (H)) for minima determination. Radio altitude above the approach terrain or touchdown zone, if provided, is advisory.

Procedures established based on use of other electronic vertical guidance (e.g., Baro VNAV, GNSS VNAV) may use a barometrically based DA (of the specified DA (H)) for minima determination if an appropriate obstacle assessment has been

completed for the region between the earliest point at which the DA may occur to the runway threshold. Radio altitude, if provided, is advisory.

For Category I a decision height (DH) is not used.

DA (H) and MDA (H) are applied to Category I instrument approach procedures as follows:

a) Category I ILS, MLS, or GLS (xLS) Approaches. For Category I approaches based on ILS, MLS, or GLS (e.g., xLS, or precision approaches), a DA (H) is typically specified. The DA (H) represents the minimum altitude in an approach to which descent may continue, or by which a missed approach must be initiated, if the required visual reference to continue the approach has not been established. The DA (H) "altitude" value is typically measured by a barometric altimeter, and is the determining factor for descent minima for a xLS approach procedure. The "height" value specified in parenthesis is typically a radio or radar altitude equivalent height above the touchdown zone (HAT) used only for advisory reference, and does not necessarily reflect actual height above underlying terrain. Where a Middle Marker (MM) beacon is installed, it may be used as advisory information, confirming a barometrically determined DA (H) that is coincident with the glide slope altitude at that point.

For approaches which normally provide vertical guidance (e.g., xLS), but when vertical guidance capability cannot be used, such as due to an airborne system failure, see section 4.3.4.2 below.

b) Category I Approaches with VNAV. For Category I approaches other than ILS, MLS, or GLS which use a published VNAV descent path to the runway threshold, a DA (H) may be specified instead of an MDA (H). See a) above for DA (H) applicability.

c) Precision Approach Radar (PAR) procedures. For Category I minima, a DA (H) may be specified for PAR. See section a) above for DA (H) applicability. Category II is not applicable to civil aircraft use of PAR.

4.3.4.2. Application of an MDA (H) for Category I. Procedures that are not based on use of vertical guidance (e.g., VOR, NDB, Back Course ILS) use the barometrically based MDA (of the specified MDA (H)) for minima determination. Radio altitude, if provided, is advisory.

a) Category I approaches other than ILS, MLS, or GLS. For Category I approaches other than ILS, MLS, or GLS, (e.g., non-precision approaches) an MDA (H) is typically specified. The MDA (H) represents the minimum altitude in an approach to which descent may continue, until either the required visual reference is established and the aircraft is in a position to continue the descent to land using normal maneuvering, or until reaching the specified missed approach point. The MDA (H) "Altitude" value is typically measured by a barometric altimeter, and is the determining factor for descent minima for approaches other than ILS, MLS, or GLS (other than xLS) Category I instrument approach procedures. The "Height" value specified in parenthesis is typically a radio or radar altitude equivalent height above the touchdown zone (HAT), and is used only for advisory reference. This height value does not necessarily reflect actual height above underlying terrain. Where a VHF marker beacon (e.g., FM) is used, it may indicate a longitudinal position for a stepdown fix, if identified in the procedure.

b) Circling Approaches. Many instrument procedures provide for circling approach minima. Sufficient visual references for manually maneuvering the aircraft to a landing must be maintained throughout a circling maneuver. The pilot must keep the aircraft's position within the established maneuvering area while performing the circling maneuver. The circling MDA (H) or equivalent must be maintained until an aircraft is in a position from which a normal descent can be made to touchdown within the touchdown zone, using normal maneuvers and a safe descent path.

4.3.4.3. Application of a DA (H), or equivalent (i.e. IM), for Category II. Procedures using Category II minima typically use a radio altimeter and the associated DH (of the specified DA (H)) for minima determination. Barometric altitude is advisory.

Procedures that have "Radio Altitude Not Authorized (RA NA)", for example due to irregular underlying terrain, typically use the first indication of arrival at the "inner marker" as a means to define the DH of the specified DA (H) for minima determination. In this instance both radio altitude and barometric altitude are advisory.

While for Category II the use of barometric altitude (DA) is advisory, this does not preclude an operator or flightcrew from initiating a missed approach if the altitude equivalent to the barometric altitude minima (DA) is reached prior to arrival at the specified DH. This applies regardless whether radio altimeter or inner marker determines the DH.

When a procedure specifies "RA NA", a DA (H) of 150' HAT is typically not used, since an equivalent marker beacon is not provided corresponding to that minima.

A barometrically specified "DA" is not currently used for air carrier Category II minima.

For Category II a Decision Height of a published DA (H) (or an equivalent Inner Marker [IM] for irregular pre-threshold terrain) is used as the applicable descent minima. Any "altitude" value specified is considered to be advisory. The altitude value is available for cross-reference and backup. Use of the barometrically referenced DA element of a published DA (H) is not currently authorized for part 121, 129 or 135 operations at U.S. facilities. The DA element of a DA (H) is applicable to Category II in other than an advisory capacity only if an operator elects to base discontinuance of an approach on the DA, if the DA is reached prior to the applicable DH.

4.3.5. Visibility and RVR minima. Visibility minima are as specified in Standard or Special Instrument Approach Procedures approved for use by the operator, or as otherwise listed in Standard OpSpecs applicable to that operator for Category I or II landing. Operating minimums may be expressed as meteorological visibility (VIS), runway visual range (RVR), or runway visibility values (RVV).

a. Meteorological visibility (VIS). Meteorological visibility may be used as reported by the NWS, a source approved by the NWS, by FAA, or a source approved by the FAA.

Outside of the U.S. meteorological reporting sources may be accepted for use by a particular operator by FAA. Outside the U.S. meteorological visibility determination may vary, and the operator should assure that the meaning, definition, and significance of any meteorological visibility reported for use in determining minima is understood by that operator's pilots.

b. Runway Visual Range (RVR). RVR is considered to be an instrumentally derived value measured by transmissometers. RVR is calibrated by reference to runway lights and/or the contrast of objects.

Controlling RVR means the reported values of one or more RVR reporting locations (TDZ, Mid, Rollout, or equivalent international locations) used to determine whether operating minima are or are not met, for the purpose of approach initiation, or in some cases, continuation. All U.S. Category I operating minimums below 1/2 statute mile (RVR2400) and all Category II and III operating minimums are based on RVR.

RVR use has practical limitations that should be familiar to both the operator and pilot. For example RVR is a value which typically only has meaning for the portions of the runway associated with the RVR report (TDZ, MID, or Rollout). RVR is a value that may vary with runway light step settings (1 through 5). Operators should assure that pilots are familiar with runway light setting effects on reported RVR. RVR may not be representative of actual visibility along portions of the runway due to the location of the transmissometer baseline and limited length of the baseline, or due to variable conditions in position or time (e.g., patchy fog). RVR is a value which could be up to six times greater than actual ground or tower visibility at night, and up to three times greater during daytime.

Outside of the U.S. some RVR reports may not be measured by transmissometers. Accordingly, operators should assure that the meaning, definition, and significance and variability of any non-instrumentally derived value of RVR reported to the pilot for use in determining minima is understood by that operator's pilots.

c. Runway Visibility Values (RVV). RVV minima are now used infrequently, are being phased out, and should be used only where minima cannot otherwise be specified as a meteorological visibility (VIS) or runway visual range (RVR).

4.3.6. Visibility Assessment and RVR Equivalence.

a. For instrument procedures where minima are expressed in terms of meteorological visibility, but reported visibility available to the flightcrew is specified as an RVR, the "visibility-RVR" equivalence table referenced in Standard OpSpecs may be used to establish equivalent meteorological visibility minima (see Appendix 7, OpSpec paragraph C051).

b. Conversely, for instrument procedures where minima are expressed in terms of RVR, but reported visibility available to the flightcrew is specified as a meteorological visibility, the "Visibility-RVR Equivalence" table referenced in Standard OpSpecs may be used to establish equivalent meteorological visibility minima (see Appendix 7, OpSpec paragraph C051).

4.3.7. General Requirements for Category I.
The following general requirements apply to the operational authorization of Category I instrument approach procedures:

1) The airborne system should meet requirements of the applicable sections of 5.2 for the type of Category I procedures to be flown,

2) Appropriate NAVAIDs and airport/lighting facilities for the procedures to be flown, consistent with Section 8, should be available,

3) Flightcrew qualification consistent with provisions of Section 7 for Category I has been completed,

4) An acceptable airworthiness program for the airborne system is provided in accordance with section 9, and

5) An operational authorization has been completed in accordance with section 10 below for a U.S. operator or section 11 below for a Non-U.S. operator.

a. **Category I minima not less than 200' DA (H)**
Instrument approach operations that may be authorized **Category I** minima not less than **200' DA (H)** include:

1) ILS

2) GLS

3) MLS

4) PAR

b. **Category I minima not less than 250' DA (H)**
Instrument approach operations that may be authorized **Category I** minima not less than **250' DA (H)** include:

1) NAVAID specific procedures with vertical (e.g., using VNAV) guidance (e.g., VOR, VOR/DME, NDB, Back Course ILS flown with FMS VNAV),

2) RNAV (3D - LNAV/VNAV) Procedures overlaying a NAVAID specific procedure (e.g., FMS/RNAV, used to fly an underlying VOR or NDB approach, but as a 3D RNAV procedure - no procedural tuning of the specified facility), and

3) RNAV/RNP Procedures.

c. **Category I minima not less than 250' MDA (H).**
Instrument approach operations that may be authorized **Category I** minima not less than **250' MDA (H)** include:

1) NAVAID specific procedures without vertical (e.g., no VNAV) guidance (e.g., VOR, VOR/DME, NDB, Back Course ILS),

2) NAVAID specific procedures with vertical (e.g., using VNAV) guidance (e.g., VOR, VOR/DME, NDB, Back Course ILS flown with FMS VNAV), NOTE: Operators (e.g., for training reasons) or instrument procedures developers (for other instrument procedure criteria reasons) may specify use of an MDA (H), even though these procedures may otherwise normally be eligible for use of a DA(H).

3) NAVAID specific procedures flown using an "open loop" vertical speed based descent profile,

4) RNAV (2D - LNAV only) Procedures overlaying a NAVAID specific procedure (e.g., FMS/RNAV, used to fly an underlying VOR or NDB approach, but as a 2D RNAV procedure - no procedural tuning of the specified facility),

5) Radar Surveillance Procedures including ASR, and

6) Other approach procedures (e.g., Airborne radar approach).

d. **SPECIAL Category I** procedures may be authorized as follows:

1) Special Obstacle Assessment procedures as approved for an operator or a group of operators (e.g., DTW RW21R Special Assessment),

2) Lower than Standard Category I minima as addressed in FAA Order 8400.13, as amended (e.g., HUD/Autoland 1800RVR minima with limited facilities), and

3) Special Limited Use (Non-ICAO) Procedures (e.g., TLS, KRM, GPS SCAT I).

e. **Use of Previous or New Criteria.** Operators approved in accordance with AC120-29 Change 3 for Category I may continue to operate in accordance with their approved program.

Aircraft demonstrated to meet airworthiness provisions of AC's AC 120-29 through Change 2, or CAA or FAA criteria previous to AC 120-29, remain eligible for any previously approved operational authorization under provisions of this AC, and do not require additional airworthiness demonstration.

Aircraft types or operators seeking credit provided for only in this AC, and not available in previous versions of AC 120-29 must meet criteria of this AC, unless authorized in OpSpecs for those particular operations prior to issuance of this AC (e.g., an operator that does not have current OpSpecs in effect for using Category II minima with U.S. Type I ILS Facilities at the time this AC is issued must meet criteria of this AC before being authorized to conduct such operations).

New Category I or II operations or airworthiness approvals may be approved using earlier criteria only on a case-by-case basis depending on circumstances (e.g., service bulletin compliance status, type certification basis, or other relevant safety factors, as for a new derivative aircraft model seeking continued certification basis compliance with an earlier version of AC 120-29, in lieu of this AC).

New aircraft types or derivative aircraft with new flight control system designs should typically be demonstrated in accordance with the requirements of the appropriate Appendix of this AC.

4.3.8. Requirements for Category II.

a. **General Category II Requirements.**
The following requirements apply to the operational authorization of Category II instrument approach procedures:

1) The airborne system should meet requirements of the applicable sections of 5.2 for the type of Category II procedures to be flown,

2) Appropriate NAVAIDs and airport/lighting facilities for the procedures to be flown, consistent with Section 8, should be available,

3) Flightcrew qualification consistent with provisions of Section 7 for Category II has been completed,

4) An acceptable airworthiness program for the airborne system is provided in accordance with section 9, and

5) An operational authorization has been completed per section 10 for a U.S. operator or section 11 for a Non-U.S. operator.

b. **Category II minima not less than 100' DA (H).**
Instrument approach operations that may be authorized **Category II** minima not less than **100' DA (H)** include:

1) ILS,

2) GLS, and

3) MLS.

c. **Use of Inner Marker.**
Use of Inner Marker may be authorized in lieu of a DA (H) at runways so designated by the applicable procedure, and where RA NA is specified.

d. **Barometric altimeter DAs not currently used for FAR 121 or FAR 135 Category II.**
Barometric altimeter specified DAs are not currently used as a basis for minima for air carrier Category II, except for those operators electing to discontinue an approach upon reaching either the DA or DH, which ever is reached first, when visual reference is not established, or upon reaching either the DA or IM, which ever is reached first, when using an IM as the basis for Category II minima.

e. **Category II on FAA Type I ILS.**
Category II on FAA Type I ILS (limited to FAA specified locations) for certain qualified flight guidance systems. Instrument approach operations may be authorized Category II minima not less than 100' DA (H). Criteria for special authorizations for air carriers to conduct Category II operations on certain FAA Type I ILS facilities is contained in FAA Order 8400.13, as amended.

f. **Category II using RVR 300 "meter" minima.**
Category II using RVR300m minima (at designated international locations) may be authorized when meeting special provisions of Standard OpSpecs paragraph C059a. Note 1 (see Appendix 7). This provision permits an operator to be authorized use of Non-U.S. State minima of RVR300m with a DA (H) of 100' HAT at certain international runways qualifying for a minima less than that specified by ICAO for Category II. A flight guidance system meeting provisions of Appendix 7 Paragraph C059 Note 1 is required. Corresponding flightcrew procedures must be used. Following successful operational experience using this provision, FAA may determine that the above authorization may be also acceptable using an autocoupled approach to 100' HAT or other flight guidance system (e.g., HUD) without necessarily meeting other provisions for Category III. Following successful operational experience using this provision, FAA may determine that the above authorization may also be approved for use at certain U.S. facilities having appropriate Category II procedures with a minimum RVR of 1000 and a DA (H) of 100' HAT.

g. **Precision Approach radar (PAR)**
PAR Minima may be authorized to minima of not less than 100' HAT, or the published PAR minima, whichever is higher. PAR authorizations are limited to those operators and crews specifically qualified to use PAR.

h. **Previously Approved Category II Operations.**
Operators approved in accordance with AC 120-29 through chapter 3 for Category II may continue to operate in accordance with their approved program. Credit for systems demonstrated prior to AC 120-29 chapter 3 will be as designated in approved OpSpecs or as designated by AFS-400. Aircraft qualified using other than FAA criteria will be as designated in approved OpSpecs or as designated by AFS-400.

4.3.9. Runway Field Length Requirements and Runway Clutter. For Category I or II, landing distance requirements are as specified by section 121.185, 121.187, 121.195 or 121.197, as applicable to the aircraft type, destination airport, or alternate airport.

The following typical means of complying with the above provisions of part 121 are considered to be acceptable. Examples are provided for turbine aircraft. Aircraft other than turbine powered aircraft, or aircraft operating under parts other than part 121, may apply equivalent provisions in a similar manner.

Part 121 turbine aircraft operations, regardless whether Category I or Category II, must meet provisions of Section 121.195(b). Normally these landing distances (e.g., which already include the specified 60% factor) are factored into the AFM data provided for landing distance. They do not have to be added additionally or separately to the AFM data.

If during dispatch, in weather forecasts or reports, it is determined that the landing runway MAY be wet (e.g., includes "chance", "occasional", "temporary", or a probability equal to or greater than 10%, the effective runway length must be at least 115% (i.e., per 121.195(d)) of the distance determined in 121.195(b).

Unless otherwise authorized by FAA, wet is considered to be any condition "not clear and dry" on any part of the useable area of the runway (useable area does not include edges, sides, melting of ice or snow banks at edges or sides, area beyond the advertised plowed and sanded surface, overruns, etc.).

> **Note 1: For some operations, FAA may authorize a damp grooved runway with good braking friction characteristics, or equivalent, to be considered a dry runway for purposes of dispatch determination.**
>
> **Note 2: Section 121.195(b) specified distance is typically based on a dry runway, unless a special showing has been made on a wet runway, for compliance with section 121.195. However, this is not typically done for most turbine aircraft types in current service (see FAA AC 121.195-1A, as amended).**

If any useable part of the expected landing runway or runways are slippery (e.g., wet and not-grooved or porous friction coarse (PFC), snow, slush, ice, or standing water) the provisions of section 121.195(d) apply. In addition, operators should consider the possible need for any additional landing distance factor, particularly if braking action is reported or expected to be worse than "good".

Guidance information on autobrake distance provided by the manufacturer may be used as the basis for Category I or Category II field length determinations, but are not required to be used.

If autobrake data (typically guidance information in the AFM) is used, the extra landing distance factor for wet runways (e.g., 115%) specified in part 121, as applicable, should be applied to the pertinent "autobrake setting" distance on which the dispatch is based.

If autobrake data is not used, the 1.15 factor is applied directly to the section 121.195(b) distance (e.g., dry runway factored distance) assuming that the AFM specified braking method and configuration is used (e.g., maximum manual braking with all brakes and antiskid operative, and without credit for reverse thrust). However, the expected landing configuration, braking method, and speeds should be considered (e.g., engine out flap settings and speeds as applicable, or partial brakes, or partial antiskid, or reverse thrust inoperative) if the effect is significant, and the non-standard configuration is planned at the time of dispatch, or is expected to be used for landing, at the time dispatch determinations are made.

Use of alternate airport field length provisions (e.g., section 121.187 or 121.197) typically apply only to those operations seeking dispatch credit for use of an alternate airport based on credit for having "Engine Inoperative Category II" capability.

The following field length factors and considerations are considered acceptable:

a. Category I Field Lengths. For minima or conditions expected to be at or above RVR3000, the runway field-length requirement for Category I is as specified by section 121.195 for either a dry or wet runway. For minima or conditions expected to be below 3000RVR the field length requirement should be based on conditions for a wet runway.

Requirements are as determined to be applicable for the operation based on applicable weather reports and forecasts considered at the time of dispatch (i.e., section 121.195 reference to "takeoff"). Once the aircraft is dispatched, it is recommended (but not specifically required) that field length requirements be reassessed if conditions significantly change from those assessed at the time of dispatch, particularly if the dispatch was based on a dry runway. This criteria presumes that dispatch is considered to take place and be completed within the period shortly before departure.

b. Category II Field Lengths. The Runway Field-Length Requirement for Category II is as specified by section 121.195 for a wet runway.

When auto brake systems are used for Category II, information must be available to the flightcrew to assist in making the proper selection of a suitable auto brake setting consistent with the field length available for landing and the runway condition, including braking action.

Category II operations should not normally be conducted with braking action less than "fair" unless the operator has a method to assure that timely updates of field conditions are passed to the flightcrew, and that the flightcrew can determine that sufficient runway length is available for the landing in the conditions reported.

c. Runway field length Airborne Considerations. Runway field length requirements are considered to be dispatch requirements. They are not normally in-flight requirements. For part 121 operations not based on a dispatch process, equivalent determinations may be made by the operator, or pilot, prior to departure. Once airborne, consideration of landing field length requirements by the flightcrew is a good operating practice, particularly if conditions change from those assumed at dispatch, but is not specifically required for normal operations. In the event of unforecast adverse weather or if failures occur, the crew should consider any adverse consequences that may result from a decision to make a landing on a particular runway (e.g., braking action reports, clutter).

NOTE: For Category III, landing distance requirements are as described in AC 120-28, as amended.

4.3.10. NAVAIDs or Landing System Sensors and Aircraft Position Determination. Various landing system sensors (NAVAIDs) or combinations of sensors may be used to provide the necessary position fixing capability to support authorization of Category I or II landing weather minima. While certain navigation sensors (NAVAIDs) are installed and classified primarily based on landing operations, the sensors described in this section may also be used for takeoff, missed approach, or other operations (e.g., RNAV position determination). Regardless of the sensors, NAVAIDs, or combination of NAVAIDs used, the NAVAIDs and sensors must provide coverage for the intended flight path and for anticipated displacements from that flight path for normal operations, rare normal operations (e.g., winds and wind gradients), and for specified non-normal operations where applicable (e.g., "VNAV out" flight path, "engine-out go-around" flight path). In addition, Category I or II authorizations should be consistent with the provisions or characteristics for specific sensors listed below in 4.3.10.1 through 4.3.10.3 unless otherwise accepted or approved by FAA.

For NAVAID specific procedures (e.g., ILS), use of ICAO recognized NAVAIDs are eligible for authorization as either a Standard Instrument Approach Procedure or as a Special Instrument Approach Procedure. NAVAID types that are not recognized by or in ICAO criteria (e.g., in Annex 6, Annex 10, ICAO Doc 9365/AN910 Manual of All Weather Operations) are eligible only for authorization as Special Instrument Approach Procedures.

4.3.10.1. Instrument Landing System (ILS). The ILS provides a reference signal aligned with the runway centerline and deviation signals when the airplane is displaced left or right of the extended runway centerline. The linear coverage area for this signal is approximately 3 degrees either side of the extended runway centerline from a point emanating at the far end of the runway. The ILS also provides a vertical flight path (nominally 3 degree descent angle) to a point in the landing zone of the runway. The vertical coverage is approximately 0.7 degrees on either side of the vertical reference path. ILS characteristics should be considered as defined in ICAO Annex 10, unless otherwise specified by FAA. U.S. ILS systems are classified by Type as defined in FAA Order 6750.24 as amended (II/D/2, etc.).

4.3.10.2. Microwave Landing System (MLS). The MLS provides a reference signal aligned with the runway centerline and deviation signals when the airplane is left or right of the extended centerline. The linear coverage area is approximately 40 degrees either side of the extended runway centerline emanating from a point at the far end of the runway. The MLS provides a vertical flight path to the runway similar to ILS. MLS characteristics should be considered as defined in ICAO Annex 10, unless otherwise specified by FAA. U.S. MLS systems are classified by Type, similar to ILS.

4.3.10.3. GNSS Landing System (GLS). GLS provides is a landing systems based upon the Global Navigation Satellite Navigation System (GNSS). For lowest Category I minima and Category II operations the landing system typically includes a local area differential augmentation system in the vicinity of the runway for which lowest Category I or Category II procedures are specified. The local area system may serve one or more runways, or nearby airports, depending on its classification for each particular runway. The classification of a GLS service may be different for different runway ends (e.g., III/E/3 for Runways 14L and 14R, but I/D/1 for RW 22L). Desired path, centerline, and deviation signals as applicable, are computed by airborne avionics. The coverage area for GLS is typically within a 25 mile radius of a primary airport, but extended service volumes are permitted. GLS provides for both vertical and lateral flight path specification to the touchdown zone of the runway(s) served, and a lateral path for rollout or takeoff guidance. GLS characteristics should be considered as defined in ICAO Annex 10, unless otherwise specified by FAA (e.g., FAA accepted references to RTCA SC-159 MASPS). U.S. GLS systems are classified by "Type" for each runway end served, similar to ILS (e.g., GLS II/D/2). Authorization for use of GLS is for each specific air carrier, aircraft, and GLS system type until pertinent GLS international standards accepted by FAA are promulgated.

4.3.10.4. Satellite Systems. Satellite systems currently consist of the United States Global Position System (GPS) and the Russian Federation GLONASS. These systems may be considered part of a Global Navigation Satellite System (GNSS).

Various forms of augmentation exist or in development including Space Based Augmentation (SBAS), Ground Based Augmentation (GBAS), and Aircraft Based Augmentation (ABAS).

Ground based augmentation may include wide area (e.g., EGNOS, WAAS) or local area augmentation (e.g., DGPS, LAAS).

GNSS may be combined with certain GBAS systems (e.g., LAAS) to provide a GNSS based Landing System (GLS).

4.3.10.4.1. GPS/GLONASS and Reference Datum Information. Satellite position fixing systems authorized for use by U.S. operators include GPS and FAA authorized augmentation systems for use with GPS (e.g., WAAS or LAAS). These systems may be used in the U.S., in U.S. territories, in other States that authorize GPS use, or in international airspace.

When using GPS or navigation systems that base position fixing on GPS, it is the responsibility of the operator to assure that in airspace outside of the U.S., that an appropriate Reference Datum (e.g., WGS-84 and NAVD-27) is used for definition of waypoint or critical path point coordinates. Information on states using WGS-84 or various other databases are typically available from commercial charting sources, and may be available on the worldwide web.

One worldwide web data source for **"Datum" information** that may be used is: **http://www.jeppesen.com/qref.html**

GLONASS or other satellite position fixing systems may be used only as approved by the CHDO/POI following coordination with AFS-400.

4.3.10.4.2. Local Area Systems. Local area augmentation systems (LAAS) are considered to include FAA's Local area augmentation system (GBAS) and non-federally provided systems (e.g., SLS).

Credit for use of LAAS augmentation is currently limited to use of DA (H) not lower than 100' HAT.

Procedures based on any form of LAAS augmentation equivalent to or better than a U.S. Type I ILS may be identified as "GLS" (GPS Landing System) procedures.

4.3.10.4.3. Wide Area Systems. Wide area augmentation systems include FAA's wide area augmentation system (WAAS) and internationally accepted systems wide area augmentation system (e.g., EGNOS).

Credit for use of WAAS augmentation alone is currently limited to use of DA (H) not lower than 200' HAT (e.g., when WAAS is not used as an input to a multi-sensor FMS system that also uses other sensors such as IRS).

Procedures based on any form of WAAS augmentation alone or WAAS augmentation in multi-sensor systems such as FMS should be identified as "RNAV" or "RNAV RNP" procedures, as applicable.

4.3.10.5. LOC/LDA/SDF/Back Course. Localizer, Localizer Descent Aid (LDA), Simplified Directional Facility (SDF), or Back Course ILS (BC) procedures are authorized for air carrier use, and may be authorized to Category I minima not less than 250' HAT.

4.3.10.6. VOR.

Authorized Procedures. VOR based procedures, when based on VOR alone, when based on multiple VORs, or when specified in conjunction with use of DME are authorized for air carrier use, and may be authorized to Category I minima not less than 250' HAT.

VOR or VOR/DME based procedures may be flown using an appropriate EHSI or ND Map Display, EHSI or ND Raw data display, Electromechanical HSI, RMI, RDMI, or using raw data cross pointer display for course guidance, as determined acceptable to the POI considering the crew qualification, training, and recency of experience applicable to that operator.

VOR procedures, when flown as a procedure without vertical guidance (e.g., without VNAV), use an MDA (H).

VOR procedures, when flown as a procedure with approved vertical guidance (e.g., with VNAV), may use a DA (H).

Use of a single VOR airborne system. Other than following an inflight failure, instrument procedures based on VOR may be flown using a single airborne VOR receiver (reference section 121.349) only under the following conditions:

1) Procedures requiring simultaneous use of more than one VOR are not authorized, unless approved for that operator and specific procedure,

2) In the event of failure of the airborne receiver, other essential element of the navigation or display system, or NAVAID, the approach can be safely discontinued at any point during the approach to touchdown, or during the missed approach,

3) Following initial climbout, a transition can be made to use of other NAVAIDs for resumption of a safe missed approach and flight to an alternate (a brief period of dead-reckoning may be permissible), and flight can be made to the alternate, including completion of a subsequent approach with different NAVAIDs, without loss of knowledge of position, loss of appropriate obstacle clearance, or loss of terrain clearance, and

4) The operator is authorized to conduct procedures using a single airborne VOR (or TACAN) receiver.

Authorization for use of a single VOR may be for a specific procedure, a group of procedures, for an operator's particular fleet of aircraft (e.g., B727 fleet), for all of an operator's aircraft, or for a geographic region (e.g., within the U.S. and U.S. territories), as applicable to the operator's route structure, and fleet.

VOR, VORTAC, or DME Fix Substitution. When used in conjunction with ILS or MLS, VOR, NDB or DME cross track fixes may be authorized for use with Category I, II, or III procedures, as applicable to the specified procedure. RNAV fixes based on FMS may be substituted for radial or cross track fixes.

Except for procedures that are specifically identified by FAA as prohibiting RNAV (FMS) fix use, RNAV cross track or along track fixes may otherwise be substituted for any marker beacon, VOR, NDB, Compass Locator or other fix on any segment of a VOR, NDB, LOC, LOC BC, ILS or MLS procedure where the corresponding VOR azimuth (radial) is procedurally specified or can be determined by the FMS to the necessary degree of accuracy and reliability.

Inoperative or Unsuitable NAVAIDs. When VOR or VOR-DME updating is used in support of area navigation (FMS), operators and flightcrews should be aware of when and how to disable use of an unsuitable NAVAID within the navigation system. This is especially true for NAVAID failure conditions that are probable to cause a significant map shift (e.g., movement of a NAVAID to a new location without corresponding update of the NAVAID position in a database).

4.3.10.7. DME. DME based procedures, when used in conjunction with VOR, NDB, LOC, LDA, SDF, or BC are authorized for air carrier use, and may be authorized to Category I minima not less than 250' HAT.

When used in conjunction with ILS or MLS, DME along track fixes may be authorized for use with Category I, II, or III procedures, as applicable to the specified procedure.

Except for Category II or Category III procedures that are specifically identified by FAA as requiring use of an Inner Marker, DME along track fixes may otherwise be substituted for any marker beacon, VOR, NDB, or Compass Locator on any segment of an ILS or MLS procedure where the corresponding DME value is procedurally specified or can be determined.

4.3.10.8. NDB.

Authorized procedures. NDB based procedures, when based on NDB alone, when based on multiple NDBs, or when specified in conjunction with use of DME are authorized for air carrier use, and may be authorized to Category I minima not less than 250' HAT.

NDB or NDB/DME based procedures may be flown using an appropriate EHSI or ND Map Display, EHSI or ND Raw data display, Electromechanical HSI, RMI, RDMI, or ADF display for course guidance, as determined acceptable to the POI considering the crew qualification, training, and recency of experience applicable to that operator.

NDB procedures, when flown as a procedure without vertical guidance (e.g., without VNAV), use an MDA (H).

NDB procedures, when flown as a procedure with approved vertical guidance (e.g., with VNAV), may use a DA (H).

Use of a single airborne ADF system. Other than following an inflight failure, instrument procedures based on NDB may be flown using a single airborne ADF receiver (reference section 121.349) under the following conditions:

1) Procedures requiring simultaneous use of more than one NDB are not authorized,

2) In the event of failure of the airborne receiver, other essential element of the navigation or display system, or NAVAID, the approach can be safely discontinued at any point during the approach to touchdown, or during the missed approach, and

3) Following initial climbout, a transition can be made to use of other NAVAIDs for resumption of a safe missed approach and flight to an alternate (a brief period of dead-reckoning may be permissible), and flight can be made to

the alternate, including completion of a subsequent approach with different NAVAIDs, without loss of knowledge of position, loss of appropriate obstacle clearance, or loss of terrain clearance.

4) The operator is authorized to conduct procedures using a single airborne ADF receiver.

Authorization for use of a single ADF may be for a specific procedure, a group of procedures, for an operator's particular fleet of aircraft (e.g., B727 fleet), for all of an operator's aircraft, or for a geographic region (e.g., within the U.S. and U.S. territories), as applicable to the operator's route structure, and fleet.

NDB Fix Substitution. RNAV (FMS) fixes may be authorized for use as an NDB substitute with Category I, II, or III procedures, as applicable to the specified procedure. RNAV fixes based on FMS may also be substituted for bearing or cross track fixes as follows. Except for procedures that are specifically identified by FAA as prohibiting RNAV (FMS) fix use, RNAV cross track or along track fixes may otherwise be substituted for any NDB, Compass Locator or other NDB based fix on any segment of a VOR, NDB, LOC, LOC BC, ILS or MLS procedure where the corresponding NDB bearing is procedurally specified or can be determined by the FMS to the necessary degree of accuracy and reliability.

Inoperative or Unsuitable NAVAIDs. If NDB updating is used in support of area navigation (FMS), operators and flightcrews should be aware of when and how to disable use of an unsuitable NAVAID within the navigation system. This is especially true for NAVAID failure conditions that are probable to cause a significant map shift (e.g., movement of a NAVAID to a new location without corresponding update of the NAVAID position in a database).

4.3.10.9. Radar Systems (e.g., PAR, ASR). Various other systems are in limited use (e.g., PAR, ASR). These systems are considered for air carrier operations only as described below.

Air carrier approach operations using ASR or PAR may only be approved if OpSpecs contain authority for their use.

For use of ASR, dedicated training is not specifically required unless the POI determines that the operators general training and qualification program is not otherwise satisfactory for routine use of ASR procedures, and that specific ASR training is needed.

For use of PAR, dedicated PAR training is appropriate unless the POI determines that the operators training and qualification program is otherwise able to assure adequate crew preparation so that dedicated PAR/GCA training or demonstration is not needed.

4.3.10.10. Other Systems, Procedures and Special Systems.

Marker Beacons. 75 MHz marker beacons are used in the NAS or internationally as part of ILS, and for other limited or special applications (e.g., stepdown fixes, departure turn points for instrument departure heading assignments). Use of marker beacons does not require dedicated crew training or qualification beyond that for conduct of ILS approaches.

Airborne Radar Approach. Operational authorization of use of any "airborne radar approach" procedure (e.g., use of ground mapping radar or equivalent) for purposes of conducting an instrument approach requires coordination with AFS-400, and may require demonstration (POC) acceptable to FAA.

KRM, RMS, SRE or other such systems or procedures (e.g., used in Europe) may only be approved for an air carrier if the aircraft is suitably equipped to receive and use the specified system and the system can meet the performance, integrity, and availability standards equivalent to those established for currently approved types of operations (ILS, FMS, etc.), to corresponding minima. Operational authorization of use of any of these systems requires coordination with AFS-400 and may require demonstration (POC) acceptable to FAA.

Transponder Landing System. Transponder Landing System or other such "multi-lateration" systems may only be approved for an air carrier if the system can meet the performance, integrity, and availability standards equivalent to those established for currently approved types of operations (ILS, FMS, etc.), to corresponding minima. Operational

authorization of use of any of these systems requires successful completion of a proof of concept demonstration (POC) acceptable to FAA.

Enhanced vision systems are intended to provide the flightcrew with a visual presentation of a view of the approach to a runway that may otherwise be obscured by weather or darkness. Air carrier approach operations using these systems may only be approved if the system can meet the performance, integrity, and availability standards equivalent to those established for currently approved types of operations (e.g., ILS, FMS, etc.), to corresponding minima. Operational authorization for use of enhanced vision systems requires successful completion of a proof of concept demonstration acceptable to FAA.

4.3.10.11. Circling Approaches. When instrument approach design criteria or operational factors do not permit a "straight-in" approach to the landing runway, circling procedures may be used. U.S. criteria require SIAP publication of circling maneuver minima if the inbound course is offset more than 30 degrees from the runway centerline. This, however, does not preclude a pilot making a straight in landing if the requirements of section 91.175 can be continuously met below DA (H) or MDA (H), to touchdown, for adequate visual reference and for normal landing maneuvering.

The circling maneuver can be initiated from any instrument approach procedure where circling is authorized, and may be continued below DA (H) or MDA (H) or beyond the missed approach point (MAP) only when the specified visual reference exists, and when a position for a normal descent to landing. Electronic course or glidepath information, or FMS flight path presentations are only considered supplementary information to visually accomplishing the circling maneuver. The pilot must keep the aircraft's position within the established maneuvering area while performing the circling maneuver. An altitude at or above the circling MDA (H) must be maintained until an aircraft (using normal maneuvers) is in a position from which a normal descent can be made to touchdown within the touchdown zone. A missed approach must be executed when external visual references are lost or sufficient visual cues to manually maneuver the aircraft cannot be maintained.

It is important to note that the published missed approach procedure may not provide obstacle clearance when below DA (H) or MDA (H), or when past the published missed approach point (MAP). If it is necessary to conduct a missed approach from below the DA (H) or MDA (H) or from past the published MAP (e.g., as a result of a balked landing, rejected landing, loss of visual reference, not in a safe position to land, blocked runway, or other similar reason for a go-around), reference to the associated IFR departure procedure for the applicable runway(s) usually provide help to the pilot in determining a safe course of action to climb back to procedurally protected airspace (adequate obstacle clearance) as specified by the published missed approach procedure.

When a missed approach from a circling maneuver is executed below DA (H), MDA (H), or beyond the published MAP, the direction of the initial turn should typically be toward the airport to assure obstacle clearance, and to keep the aircraft within the maneuvering area, until climb above the DA (H) or MDA (H), and intercept of a published segment of the missed approach procedure.

Operators may elect either to be authorized to perform circling approaches as published, or elect to not train to and routinely perform circling approaches. If an operator elects not to train to and perform circling approaches, typically a 1000 ft HAT DA (H) or MDA (H) and 2 mile visibility limit, or greater, is placed on OpSpecs minima for that operator or aircraft type. If the operator elects to train and check crews in performing circling approaches, OpSpecs typically permit use of published circling minima.

It is recommended that unless special circumstances exist, wide body (long wingspan) aircraft or aircraft needing to accomplish circling maneuvers at speeds in excess of 170 KTS ground speed should not typically be authorized circling minima below 1000' HAT and 3 miles meteorological visibility.

4.4. RNAV/Flight Management Systems (FMS). An FMS provides a means to navigate along a flight path based upon earth referenced waypoints. These waypoints can define a flight path that originates or terminates at a runway, or at other relevant fixes located in terminal or en route airspace. This type of system may be approved for low visibility approach and missed approach operations in accordance with criteria in pertinent appendices of this AC and standard OpSpecs. For departure, criteria is specified in AC120-28D for RVRs requiring non-visual takeoff guidance on the runway, and in AC

120-CNS (Draft, as published, or as amended), for departure procedures that do not require use of non-visual takeoff guidance on the runway.

FMS systems eligible to use criteria of this section must meet criteria of AC 25-15, AC 20-129 and AC 20-130, or equivalent.

FMS operations may be based on 3D or 2D RNAV procedures, and may or may not include use of RNP. For RNP operations, additional information is provided below and in sections 4.5 and Appendix 5.

FMS may be used to conduct instrument approaches other than RNAV, ILS, MLS, or GLS (e.g., VOR, VOR/DME, NDB, LOC, LOC Back Course). For these approach types, unless otherwise approved by FAA, respective criteria of FAA Order 8260.3, as amended, applicable to the type of NAVAIDs used is applicable. Vertical criteria of FAA Order 8260.40A, or other criteria acceptable to FAA, may optionally be used to specify vertical obstacle clearance criteria for use of VNAV.

FMS may be used as a 2D or 3D RNAV system, as applicable, to conduct RNAV instrument approaches. For these approach types, unless otherwise approved by FAA, respective criteria of FAA Order 8260.3 (U.S. TERPS), as amended, applicable to RNAV approaches is applicable. Vertical criteria of FAA Order 8260.40A, or other criteria acceptable to FAA, may optionally be used to specify vertical obstacle clearance criteria for use of VNAV. RNAV procedures may be authorized based on specific procedure identified NAVAIDs, or when approved for a particular operator and procedure, may alternately be authorized to use DME-DME based updating, VOR/DME updating, or GPS updating other than that for the procedurally identified NAVAID.

FMS may be used as a 2D or 3D RNAV RNP system, as applicable, to conduct RNAV instrument approaches based on RNP obstacle clearance criteria. For these approach types, unless otherwise approved by FAA, respective criteria of Appendix 5 applicable to RNP based RNAV approaches is applicable. RNP vertical criteria or vertical criteria of FAA Order 8260.40A, or other criteria acceptable to FAA, may optionally be used to specify vertical obstacle clearance criteria for use of VNAV.

FMSs which do not incorporate provisions for RNP as part of their type design approval, but nonetheless meet applicable provisions of RTCA DO-236 Appendix D for fleet qualification for one or more RNP levels, may use corresponding RNP procedures and criteria (e.g., Appendix 5). For these FMS systems, if specifically approved by FAA for applicable RNP levels, respective criteria of Appendix 5 applicable to RNP based RNAV approaches may be used. RNP vertical criteria or vertical criteria of FAA Order 8260.40A, or other criteria acceptable to FAA, may optionally be used to specify vertical obstacle clearance criteria for use of VNAV. Examples of aircraft and systems which may typically "fleet qualify" under this provision would be aircraft having dual FMSs incorporating GPS updating, or dual FMSs using DMD-DME updating that are operating in an area with multiply redundant DME facilities, with many facilities providing acceptable position update geometry and accuracy.

For international operations, equivalent criteria to the criteria specified above (e.g., ICAO PANS-OPS) may be used. In addition, operators may use criteria of this AC, and related US criteria referenced by this AC, internationally when approved by FAA, and when found acceptable by the "State of the Aerodrome" for the procedure being used.

4.5. Required Navigation Performance (RNP). RNP is a navigation performance standard for a particular area, airspace, route, procedure or operation. A definition of RNP is specified in Appendix 1. RNP addresses the aircraft and navigation service (non-aircraft) accuracy, integrity, continuity and availability requirements for normal and rare fault-free performance and for performance with failures. RNP specifies the nominal and limit lateral, and if applicable, vertical flight path displacements permissible for a particular procedure. RNP can be related to obstacle clearance or aircraft separation requirements to ensure a consistent set of operational procedures and design requirements.

A **desired flight path** through the airspace is identified by an airspace planner for each route or procedure. This flight path can be a complex path defined by waypoints or it can be a continuous curved or straight line.

In order for an aircraft to follow the desired flight path it is necessary that the navigation system (airborne or on the ground) generate a **defined flight path** which is a close approximation (ideally equal) to the desired path. The difference between

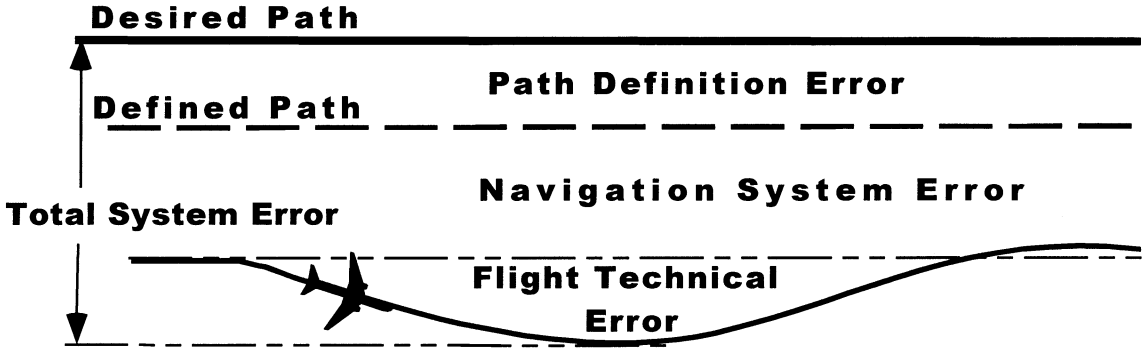
the desired path and the defined path is called the **path definition error.** This error may be due to survey errors, database resolution limitations, etc.

The aircraft elements of the navigation system estimate the aircraft's position and compares that position with the defined flight path. A deviation indication is produced which represents the perceived displacement of the airplane from the desired flight path. This deviation is typically displayed on a primary flight display, or navigation displays, for flightcrew awareness, and is provided as an input to an autopilot and/or flight director system for command guidance or automatic control.

Any error in the estimation of the aircraft's position is referred to as position estimation error, or **navigation system error**. Any error introduced in the display of the deviation signal on the primary flight display is a display error. Navigation system error can include display errors. The navigation system error will result in a displacement from the defined flight path.

The difference between the flight path as prescribed by maintaining the navigation deviation signal at zero and the path that the aircraft actually follows is called **flight technical error** (FTE). The FTE can be influenced by external environment conditions such as wind gradient, turbulence, etc. and flightcrew response to guidance (e.g., Flight Director).

The sum of the path definition error, Navigation system error (including display error if applicable) and the flight technical error is the **total system error** (TSE), which is the difference between the desired flight path and the actual flight path.



Standard Levels of RNP typically used for various approach and missed approach segments supporting Category I procedures may be based on use of specific landing systems (e.g., ILS, MLS, or GLS), on multi-sensor RNAV (e.g., FMS with IRS, VOR, DME inputs), or on other aircraft navigation systems having FMS like capabilities (e.g., GPS Navigation Systems).

Standard Levels of RNP typically used for various approach and missed approach segments supporting Category II procedures may be based on use of specific landing systems (e.g., ILS, MLS, or GLS), or on multi-sensor RNAV systems having suitable flight critical performance (e.g., FMS with IRS, ILS, and/or DGNSS inputs).

Particular levels of RNP can be satisfied using various NAVAIDs such as ILS and MLS, or by the use of a combination of navigation sensors (VOR/DME, IRU/IRS, GNSS, etc.) using a navigation computer (e.g., FMS). When a computed path (e.g., series of waypoints) is used as the basis for an approach operation, the desired flight path must typically be defined by a series of three dimensional earth based coordinates for the applicable waypoints or path definition points.

Approach or missed approach operations can be approved by demonstration of the capability to meet the required navigation performance (e.g., accuracy, integrity, availability) for a specific approach procedure, for a set of particular procedure types, or for a set of RNP levels.

The transition from typical en route or terminal RNP levels to an approach RNP level is accomplished by transitioning to the required RNP level for the approach in accordance with the approved instrument procedure or by a point no later than the final approach fix, if an aircraft is radar vectored to final (refer to AC 120-CNS).

Although RNP applications specify containment at a value of RNPx2, this does not preclude additional operational assessments beyond the value of RNPx2 for purposes of obstacle, terrain, or traffic identification. Such assessments beyond RNPx2 are intended only for the purpose of identifying potential obstacles, terrain, or traffic for procedure charting, crew awareness, air traffic separation buffers or other such operational reasons, and do not affect the selection or designation of a flight path or route. Obstacles, terrain, or traffic should not normally be within RNPx2 unless separation from the intended obstacle is not based on use of RNP containment.

4.5.1. Standard RNP Types. Standard values of RNP supporting initial, intermediate, or final approach segments, or missed approach segments are as specified in Table 4.2.5-1 below:

Table 4.2.5-1.
STANDARD RNP TYPES FOR APPROACH

RNP Type	Applicability/Operation (Approach segment)	Normal Performance (95%)	Containment Limit
RNP 1	Initial/Intermediate approach	+/-1 nm	+/-2 nm
RNP 0.5	Initial/Intermediate/Final approach [Supports limited Category I minima)]	+/-0.5 nm	+/-1 nm
RNP 0.3	Initial/Intermediate/Final approach [Supports limited Category I minima]	+/-0.3 nm	+/-0.6 nm
RNP 0.3/125	Initial/Intermediate/Final approach with specified baro vertical guidance[Supports limited Category I minima]	+/-0.3 nm +/-125 ft	+/-0.6 nm +/-250 ft
RNP 0.03/45	Final approach with specified vertical guidance[Supports Category I minima]	+/-0.03 nm +/-45 ft	+/-0.06 nm +/-90 ft
RNP 0.01/15	Final approach with specified vertical guidance [Supports Category I/II minima]	+/-0.01 nm +/-15 ft	+/-0.02nm +/-30 ft
RNP 0.003/15	Final approach with specified vertical guidance [Supports Category I/II/III minima]	+/-0.003 nm +/-15 ft (*)	+/-0.006 nm +/-30 ft (*)

(*) Note: Vertical accuracy does not apply below 100 feet HAT - below 100 feet HAT vertical performance is determined by applicable standards for touchdown performance.

RNP is a required navigation performance level described by the specification of a numeric value indicating the required navigation accuracy for a specific operation, typically specified laterally in nautical miles - e.g., RNP 1 is a Required Navigation Performance of +/-1 nautical mile (95% Probability).

RNP containment is specified as RNP (X) x 2.

Standard RNP Levels are defined for lateral performance, or lateral and vertical performance, if applicable. Standard values for RNP for general use are specified in [RTCA SC181MASPS DO-xxx], AC120-CNS, and the ICAO RNP Manual [list reference]. For Approach and missed approach standard RNP values are listed in Section 4.2.5 above.

Longitudinal values for RNP are reserved for future operations.

4.5.2. Non-Standard RNP Types. Non-Standard RNP Types may include RNP Types other than those specified in 4.2.5.

Examples of Non-Standard RNP Types may be those types specified by a particular Authority for particular applications (e.g., RNP 5 within certain geographic areas; RNP 17 for a particular air carrier "Special approach Procedure").

4.6. Flight Path Definition. Certain flight segments and waypoints are necessary to effectively implement approach and missed approach operations using landing systems where the required flight path is not inherent in the signal structure of the navigation aid (e.g., satellite systems and other integrated multi-sensor area navigation systems). The concepts and criteria described below may be applied to other types of navigation systems when using area navigation and RNP concepts.

The approach flight path terminates in the landing zone. The following criteria and considerations are necessary to specify the landing and rollout flight path. The approach segments connect with the landing and rollout segments.

Landing and Rollout Flight Path. The following criteria specifies certain reference points and other criteria necessary to effectively implement landing and rollout operations using a landing system where the required flight path is not inherent in the signal structure of the navigation aid (e.g., satellite systems).

Runway Datum Point (RDP). The RDP is used in conjunction with the FPAP and the geometric center of the WGS-84 ellipsoid to define the geodesic plane of a precision final approach flight path to touchdown and rollout. It is a point at the designated center of the landing runway defined by latitude, longitude, ellipsoidal height, and orthometric height. The RDP is a surveyed reference point used to connect the approach flight path with the runway. The RDP may not be coincident with the designated runway threshold.

Flight Path Alignment Point (FPAP). The FPAP is used in conjunction with the RDP and the geometric center of the WGS-84 ellipsoid to define the geodesic plane of a precision final approach, landing and flight path. The FPAP may be the RDP for the reciprocal runway.

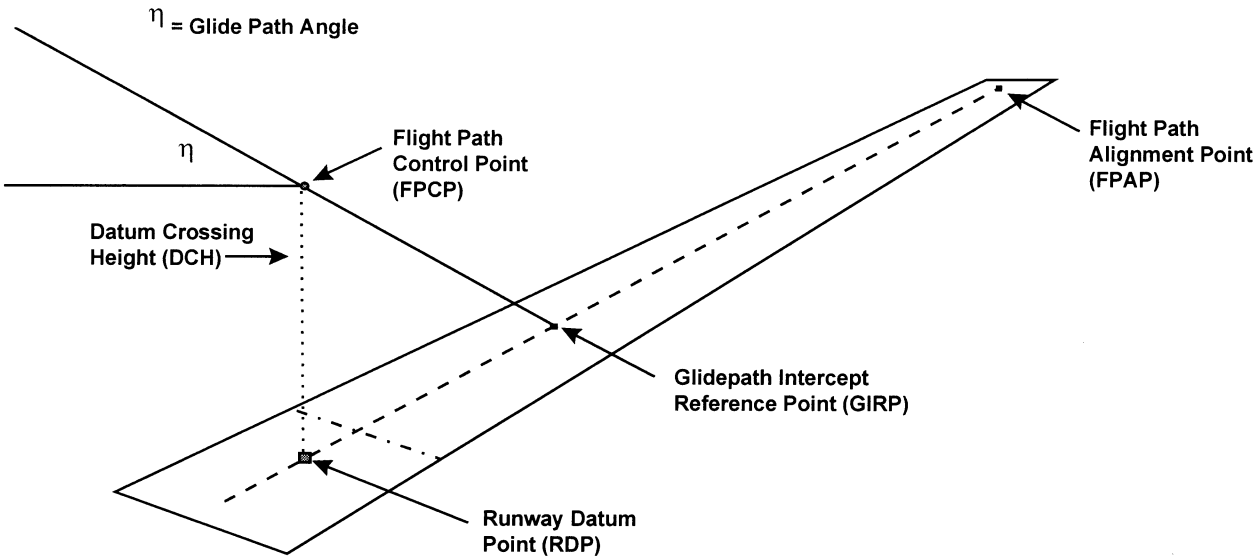
Flight Path Control Point (FPCP). The FPCP is a calculated point located directly above the RDP. The FPCP is used to relate the vertical descent of the final approach flight path to the landing runway.

Datum Crossing Height [DCH]. The height (feet) of the FPCP above the RDP.

Glide Path Angle [GPA]. The glide path angle is an angle, defined at the FPCP, which establishes the intended descent gradient for the final approach flight path of a precision approach procedure. It is measured from a horizontal plane that is parallel to the WGS-84 ellipsoid at the FPCP.

Glidepath Intercept Reference Point [GIRP]. The GIRP is the point at which the extension of the final approach path intercepts the runway.

Figure 4.6-1



The locations established for, and the values assigned to, the **RDP, FPCP, DCH** and **GPA** will be selected based upon the operation need to establish the required **GIRP**. Operational considerations include:

1) Path of wheels over threshold,

2) Need for coincidence with other aids and systems - visual and non-visual,

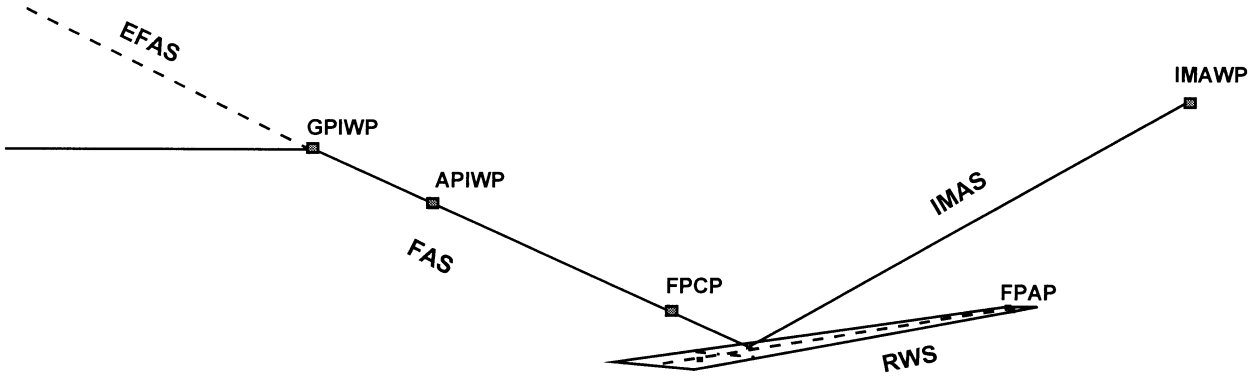
3) Runway characteristics (upslope and downslope, crown etc.),

4) Real, displaced and multiple thresholds,

5) Real clearways - stopways

Approach and Missed Approach Segments. Figure 4.6-2 below shows the minimum set of reference points, path points, waypoints and leg types considered necessary to construct and use such instrument approach procedures in air carrier operations.

Figure 4.6-2



Waypoints.

GPIWP Glide Path Intercept Waypoint - The point at which the FAS projects to intercept the runway surface

APIWP Approach Intercept Waypoint - variable Waypoint used only when intercepting the Final Approach Segment (FAS)

FPCP Flight Path Control Point

FPAP Flight Path Alignment Point

IMAWP Initial Missed Approach Waypoint (Used only for MAP)

Segments.

FAS Final Approach Segment. That segment of an approach extending from the GPIWP or APIWP, whichever occurs later, to GIRP.

EFAS Extended Final Approach Segment. That segment of an approach, co-linear with the FAS, but which extends beyond the GPIWP or APIWP.

RWS Runway Segment. That segment of an approach from the GPIWP to FPAP.

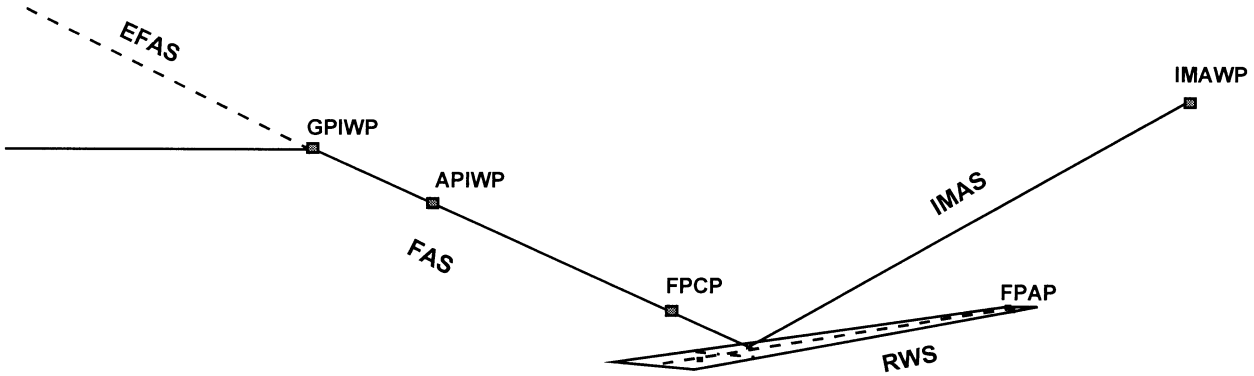
IMAS Initial Missed Approach Segment. That segment of an approach from the GPIWP to the IMAWP.

5. AIRBORNE SYSTEM REQUIREMENTS.

5.1. General. The following accuracy, integrity and availability criteria are specified for aircraft systems intended for Category I or II. Aircraft related systems are addressed by 5.1.1, Non-aircraft systems (e.g., NAVAIDs) are addressed in 5.1.2, Specification of flight path is addressed in 5.1.3, such as is applicable to defining an RNAV LNAV or VNAV path to be followed by an aircraft, and specific airborne equipment requirements for Category I or II authorizations are addressed in 5.2 and 5.3.

5.1.1. Airborne Systems. Airworthiness criteria for aircraft systems intended to meet requirements of this AC are specified in paragraph 5.1.3 through 5.19 below, or Appendix 2 or 3 for demonstration of airborne systems for eligibility for Category I or II minima respectively.

Figure 4.6-2



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For aircraft which completed an airworthiness demonstration applicable to Category I or II using earlier versions of this AC, or previous applicable ACs, new operational authorizations may be requested or may be continued only as provided for in standard OpSpecs.

5.1.2. Non-Airborne Systems. Unless otherwise specified in the Appendices to this AC, NAVAID/landing system characteristics, including facility classification, should be considered as specified in AC 120-29 for ILS, MLS or GLS (e.g., U.S. use of ICAO Annex 10 Criteria, FAA Order 6750.24 as amended, and the applicable NAVAID facility classification for Category III). NAVAID facility use is predicated on applicable ILS, MLS, or GLS Type classifications (e.g., ILS III/E/2; GLS II/D/2) or equivalent classification at non-U.S. facilities.

For GLS, an appropriate alternate equivalent classification to ILS, as specified by FAA or ICAO, may also be used (e.g., Performance Level/Coverage/Integrity as in "PL2/T/1").

5.1.3. Flight Path Specification.

5.1.3.1. Lateral.

Category I. The following levels of lateral performance shown in Table 5.1.1-1 are acceptable for Category I, and corresponding minima may be applied. Any one or more methods listed below may be demonstrated, but the method(s) used should be identified as the basis for the demonstration.

Table 5.1.1-1.
CATEGORY I - LATERAL PERFORMANCE/MINIMA

1)	ILS/MLS/GLS (any one xLS, or any combination provided by MMR)	[Minima equivalent to ILS at 200' HAT] [Lateral performance from 1500'HAT to 200' HAT within ±35microamps deviation from the indicated course or path, or equivalent, (for 95% of samples taken), without undue oscillation]
2)	"ILS Equivalent" (e.g., SCAT I/ MASPS;WAAS/MOPS)	[Minima equivalent to ILS at 200' HAT]
3)	RNP RNP $\leq$ .03 .03 <RNP< .3 RNP $\geq$ .3	 [Minima equivalent to ILS at 200' HAT] [Minima typically not lower than a DA(H) of 250' HAT] [Minima restricted to not lower than a DA(H) of 250' HAT]
4)	FMS (LNAV/VNAV or LNAV)	[Minima restricted to not lower than a DA(H) of 250' HAT]
5)	RNAV (Op-Specs Part C; Para C063)	[Minima as specified by Standard OpSpecs/SIAP]
6)	LOC, LOC BCRS,VOR, VOR/DME, NDB, ASR, PAR	[Minima as specified by Standard OpSpecs/SIAP]

Category II. The following levels of lateral performance shown in Table 5.1.1-2 are acceptable for Category II. Any one or more methods may be demonstrated, but the method used should be identified as the basis for the demonstration.

Table 5.1.1-2.
CATEGORY II - LATERAL PERFORMANCE/MINIMA

1)	ILS/MLS/GLS (any one xLS, or any combination provided by MMR)	[Minima equivalent to ILS at 100' HAT] [[Lateral performance from 200'HAT to 100' HAT within ±25microamps deviation from the indicated course or path, or equivalent, (for 95% of samples taken), without undue oscillation]
2)	RNP RNP < .01	 [Minima equivalent to ILS at 100' HAT]

Lateral Performance below or beyond DA (H). For either Category I or II procedures with a DA (H) below 250'HAT*, when guidance is provided (e.g., for autoland, or HUD flare/rollout), the lateral performance should at least be equivalent to that attainable using an ILS Type I/E/1 localizer (or RNP .003) from 200' HAT, or 100' HAT as applicable, to the end of rollout.

***NOTE: This provision does not apply to systems intended for Category III - see AC120-28D for Category III requirements.**

From 200' HAT or 100' HAT, as applicable, until returning to an established missed approach segment of the approach procedure, if guidance is provided, performance should be at least equivalent to that attainable using an ILS Type I/E/1 localizer front and back course, or RNP.3 as applicable.

5.1.3.2. Vertical.

Category I. The following levels of vertical performance are acceptable for Category I, and corresponding minima may be applied. Any one or more methods listed below may be demonstrated, but the method(s) used should be identified as the basis for the demonstration.

Table 5.1.2-1.
CATEGORY I - VERTICAL PERFORMANCE/MINIMA

1)	ILS/MLS/GLS Glide Slope/Glide Path (any one xLS Glide Slope, or any combination provided by MMR)	[Minima equivalent to ILS at 200' HAT] [Vertical performance from 700'HAT to 200' HAT within $\pm$35microamps deviation from the indicated course or path, or equivalent, (for 95% of samples taken), without undue oscillation]
2)	"ILS Glide Slope Equivalent" (e.g., SCAT I/ MASPS; WAAS/MOPS)	[Minima equivalent to ILS at 200' HAT]
3)	RNP RNP $\leq$ .03 and ECEF VNAV .03 <RNP< .3 and BARO VNAV RNP $\geq$ .3 with or without BARO VNAV	 [Minima equivalent to ILS at 200' HAT] [Minima typically not lower than a DA(H) of 250' HAT] [Minima restricted to not lower than a DA(H) of 250' HAT]
4)	FMS BARO VNAV	[Minima restricted to not lower than a DA(H) of 250' HAT]
5)	RNAV (Op-Specs Part C; Para C63)	[Vertical performance not applicable*]
6)	LOC, LOC BCRS,VOR, VOR/DME, NDB, ASR, PAR	[Vertical performance not applicable*; except PAR minima equivalent to ILS]

***Note: A procedure addressing a stabilized approach from the Final Approach Fix to MDA (H) is recommended for these procedures (except this note does not apply to PAR).**

Category II. The following levels of vertical performance are acceptable for Category II. Any one or more methods may be demonstrated, but the method used should be identified as the basis for the demonstration.

Table 5.1.2-2
CATEGORY II - VERTICAL PERFORMANCE/MINIMA

1)	ILS/MLS/GLS (any one xLS Glide Slope/Glide Path, or any combination provided by MMR)	[Minima equivalent to ILS at 100' HAT] [Vertical performance from 200'HAT to 100' HAT within $\pm$35microamps deviation from the indicated course or path, or $\pm$12 ft, which ever is greater, or equivalent, (for 95% of samples taken), without undue oscillation]
2)	RNP RNP $<$ .01 with ECEF VNAV	[Minima equivalent to ILS at 100' HAT]

Category I or Category II.

Vertical (VNAV) performance at altitude constraints prior to a Final Approach Fix (FAF) or Final Approach Point (FAP), or at a FAF or FAP. For procedures with VNAV segment(s) prior to a FAF or FAP, at a FAF or FAP (e.g., intercepting a FAS from an en route segment, STAR, Profile Descent, initial approach or intermediate approach segment), vertical performance should normally be based on use of a vertical "Fly by" path rather than a "Fly over" path. The small vertical displacement which may occur (40' - 80' typically) at a vertical constraint as a result of using a vertical "Fly by" waypoint rather than vertical "Fly over" waypoint is considered operationally acceptable, and desirable, to assure asymptotic capture of a new (next) vertical segment. This applies to both "level off" or "altitude acquire" segments following a climb or descent, or vertical climb or descent segment initiation, or joining of climb or descent paths with different gradients.

Vertical (VNAV) performance at waypoint altitude constraints near the point at which DA (H) or MDA (H) may occur. For procedures with waypoints at or near the point at which DA (H) may occur, vertical (VNAV) performance should not preclude continuous descent of the aircraft to the runway, following the established VNAV path to the runway (e.g., VNAV should not initiate inappropriate capture of a missed approach segment and automatic level off (at MDA (H)) or initiation of MAP climb, without pilot confirmation that a missed approach or go-around is intended (e.g., TOGA initiation).

Vertical (VNAV) performance below or beyond DA (H) or MDA (H). For procedures with a DA (H) below 200' HAT* (e.g., for autoland, or HUD flare/rollout), the glide path/glide slope vertical performance should at least be equivalent to that attainable using an ILS glide slope at a facility classified as Type I/E/1, between 200' HAT and 50' HAT.

***NOTE: This provision does not apply to systems intended for Category III - see AC120-28D for Category III requirements.**

5.1.3.3. Longitudinal. Longitudinal (along track) requirements for Category I or II operations are as specified below.

Category I. The following longitudinal (along track) requirements are acceptable for Category I. Any one or more methods listed below may be demonstrated, but the method(s) used should be identified as the basis for the demonstration.

Table 5.1.3-1
CATEGORY I - LONGITUDINAL PERFORMANCE/MINIMA

1)	ILS/MLS/GLS (any one xLS, or any combination provided by MMR)	
	Use of VHF OM/MM Marker Beacons	[Minima equivalent to ILS at 200' HAT]
	Use of VOR/TACAN Fixes (other than for MM)	[Minima equivalent to ILS at 200' HAT]
	Use of LOM/LMM NDBs	[Minima equivalent to ILS at 200' HAT]
	Use of suitable DME Distance Information	[Minima equivalent to ILS at 200' HAT]
	Use of FMS RNAV Fixes (other than for MM)	[Minima equivalent to ILS at 200' HAT]
	Use of Distance to "Runway Threshold WP"	[Minima equivalent to ILS at 200' HAT]
	Other methods (e.g., Radar fixes, Fan Markers)	[Restricted minima may apply - DA(H)$\geq$250' HAT]
	No specific method of assuring along track position	[Restricted minima may apply - DA(H)$\geq$250' HAT]
2)	"ILS Equivalent" (e.g., SCATI/MASPS;WAAS/MOPS)	[Same as for ILS/MLS/GLS described above
3)	RNP*	
	RNP $\leq$ .03	[Minima equivalent to ILS at 200' HAT]
	.03 <RNP< .3	[Minima typically not lower than a DA(H) of 250' HAT]
	RNP $\geq$ .3	[Minima restricted to not lower than a DA(H) of 250' HAT]
		*Note: RNP Systems/Procedures that do not provide for display of distance to a "Runway Threshold WP" may have minima additionally restricted.
4)	FMS (LNAV/VNAV or LNAV)	[Minima restricted to not lower than a DA(H) of 250' HAT]
5)	RNAV (Op-Specs Part C; Para C63)	[Minima as specified by Standard Op-Specs/SIAP]
6)	LOC, LOC BCRS,VOR, VOR/DME, NDB, ASR, PAR	[Minima as specified by Standard Op-Specs/SIAP]

Category II. The following levels of longitudinal (along track) performance are acceptable for Category II. Any one or more methods may be demonstrated, but the method used should be identified as the basis for the demonstration.

Table 5.1.3-2
CAT II - LONGITUDINAL PERFORMANCE/MINIMA

1)	ILS/MLS/GLS (any one xLS, or any combination provided by MMR)	Same as for Category I, except that an IM or suitable distance readout to a "Runway Threshold WP" is also required.
2)	RNP RNP $\leq$ .01	[Same as for ILS/MLS/GLS above.]

5.1.3.4 Typical Wind and Wind Gradient Disturbance Environment. The lateral and vertical performance described in sections of 5.1.3 above should typically be expected to be achievable in conditions at least as described below. Performance may be estimated, assessed analytically, demonstrated in simulation, or demonstrated in flight. Relevant associated information on demonstrated winds encountered or estimated wind gradient capability may be included in the AFM, as desired by the applicant.

Systems intended for use with procedures for either Category I or Category II should be capable of coping with at least the following wind, wind gradient, and turbulence conditions:

Surface Headwind Component - 25 kts
Surface Tailwind Component - 10 kts
Surface Crosswind Component - 15 kts

Wind Gradients/Shear - at least 4 kts per 100' from 500' HAT to the surface;

Recommended Capability - Ability to cope with 8 kts per 100' for 500', moderate turbulence, knife edge shears of at least 15kts over 100', 20 kts lateral directional vector shears of 90 deg over 100', and ability to cope with a 20 kt logarithmic shears between 200' and the surface.

5.2. Airborne Equipment for Category I. The following equipment in addition to the instrument and navigation equipment required by 14 CFR for IFR flight is the minimum aircraft equipment considered necessary for a Category I authorization.

1) For ILS, GLS, or MLS approach:

- 2 navigation receivers (unless otherwise authorized by FAA for the facilities and route to be used. For GLS, at least one GBAS receiver for GNSS position fix correction data is considered to be acceptable)

- Suitable navigation displays, attitude, vertical speed, and airspeed displays for each pilot

- Suitable failure annunciation visible to each pilot

- 1 or more Marker Beacon systems (unless an approved RNAV substitute is available, or if not necessary for the route of flight, including alternates).

- 1 or more DMEs (unless an approved RNAV substitute is available, or if not necessary for the route of flight, including alternates).

- 1 or more ADFs (unless an approved RNAV substitute system is available, or unless ADF is not required for the intended route of flight, including alternates). Note 2 ADFs may be required in accordance with section 121.549 for certain international operations, and for certain obstacle or terrain critical departure, approach, or missed approach procedures.

- It is recommended that the following capability be available: Radar Altimeter, standby power for at least one pilot's ILS/GLS nav receiver and displays, rain removal capability.

2) For approaches other than ILS, GLS, or MLS (e.g., RNAV, VOR, VOR/DME, NDB).

- 2 navigation receivers and associated displays of the type of the approach system to be used (unless otherwise authorized by FAA for the facilities and route to be used), or

- 2 FMS systems (unless use of 1 is authorized by FAA for the facilities and route to be used) which are capable of using the necessary NAVAIDs or equivalent (e.g., space vehicles (SVs)), or which can be monitored by using raw data NAVAID data (e.g., on an associated ND display or RDMI).

- Suitable navigation displays, attitude, vertical speed, and airspeed displays for each pilot

- Suitable failure annunciation visible to each pilot

- For ASR or PAR, at least 2 com radios capable of receiving communications of ASR or PAR information.

- It is recommended that the following capability be available: Radar Altimeter, standby power for at least one pilot's VOR or RNAV nav receiver and displays, rain removal capability.

5.3. Airborne Equipment for Category II. In addition to the aircraft equipment required for Category I, the following equipment is required for Category II:

1. An Automatic Flight Control System or manual flight guidance system (e.g., flight director) designed to meet criteria of Appendix 3, or for aircraft types and systems previously approved using earlier criteria the aircraft must meet the earlier criteria. At least 1 autopilot (AFGS) and at least dual flight director systems with an independent display for each pilot is recommended. Dual systems which provide the same information to both pilots, with the second system in "hot standby status" may be acceptable only if suitable comparison monitoring between the systems is available, and timely transfer to standby can be completed, and suitable annunciation to the flightcrew is provided.

2. A radar altimeter display for each pilot. (Note: At least 2 independent radar altimeters with a display for each pilot are recommended.)

3. Rain removal equipment is required for each pilot (e.g., windshield wiper, bleed air). (Note: hydrophobic coating for windshield are recommended in lieu of rain repellent.)

4. Flight instruments, annunciations which can reliably detect and alert the flightcrew in a timely manner to failures, abnormal lateral or vertical displacements during an approach, or excessive lateral deviation.

5. Unless otherwise approved by FAA based on demonstration of acceptable pilot workload, an autothrottle system should be provided.

5.3.1. Standard Category II Minima. Standard Category II minima are a DA (H) of 100' HAT and RVR not less than 1200 feet (350m).

5.3.2. Special Category II Authorizations. Special Category II minima may be authorized for certain qualifying ILS/GLS facilities (e.g., Type I ILS). Minima at these facilities may be restricted as follows depending on NAVAID, airport facility, and obstacle assessments by FAA.

DA (H) 150' HAT RVR 1800

DA (H) 150' HAT RVR 1600

DA (H) 100'HAT RVR 1800

DA (H) 100' HAT RVR 1600

DA (H) 100'HAT RVR 1200

5.4. Automatic Flight Control Systems and Automatic Landing Systems. Automatic Flight Control Systems, Autoland Systems, or Manual Flight Guidance systems (e.g., HUD) are considered acceptable for use and are recommended for Category I or II ILS, MLS, or GLS procedures which do not have NOTAM restrictions on localizer or glide slope or equivalent signals (e.g., Glide Slope unusable below 500'HAT, or Localizer unusable inside threshold).

5.5. Flight Director Systems. Characteristics of Flight Director Systems (head down or head up) used for aircraft authorized for Category I or II should be compatible with any characteristics of autopilot or autoland system used. Flight control systems which provide both autopilot control and flight director information may display, or may not display, flight director commands as appropriate for the system design and operator requirements. Regardless of whether Flight Director commands are provided, situational information displays of navigation displacement must also be provided to both flight crewmembers. To assure that unacceptable deviations and failures can be detected, the displays must be appropriately scaled and readily understandable in the modes or configurations applicable.

5.6. Head-up Display Systems. Head-up Display systems used as the basis for a suitable Category I or II authorizations must provide guidance for one or both pilots as appropriate for the system design. If information is provided to only the flying pilot, then appropriate monitoring capability must be established for the non-flying pilot. Monitoring tasks must be identified, and the non-flying pilot must be able to assume control of the aircraft in the event of system failure or incapacitation of the pilot using the HUD (e.g., for a safe go-around or completion of rollout). Head-up Display Systems acceptable for Category I or II must meet provisions of Appendix 2 or 3 respectively, or acceptable earlier criteria specified by the FAA and referenced in an AFM.

5.7. Enhanced/Synthetic Vision Systems. Enhanced/Synthetic Vision Systems based on millimeter wave radar or other such sensors may be used to assure the integrity of other flight guidance or control systems in use during Category I or II operations. They must be demonstrated to be acceptable to FAA in a proof of concept evaluation and they must otherwise meet the requirements of Appendix 2 or 3 of this AC as applicable. Use of Enhanced/Synthetic Vision Systems for purposes other than establishing the accuracy or integrity of flight guidance system performance must be demonstrated to be acceptable through proof of concept testing prior to identification of specific airworthiness and operation criteria.

5.8. Hybrid Systems. Hybrid systems (e.g., a fail passive autoland system used in combination with a monitored HUD flight guidance system) may be acceptable for Category I or II if the system provides the equivalent performance and safety to a non-hybrid system as specified for the minima sought (e.g., Category I or II).

Hybrid systems with automatic landing capability should be based on the concept of use of the automatic landing system as the primary means of control, with the manual flight guidance system serving as a backup mode or reversionary mode.

Any transition between hybrid system elements (e.g., control transition from autoland use to manual control HUD use, or for response to failures) must be acceptable for use by properly qualified flightcrews (e.g., qualified in accordance with Part 121, SFAR 58, or equivalent JAA criteria, as applicable, and standard industry practices). Transitions should not require extraordinary skill, training, or proficiency.

For any system which requires a pilot to initiate manual control at or shortly after touchdown, the transition from automatic control prior to touchdown to manual control using the remaining element of the hybrid system (e.g., HUD) after touchdown must be shown to be safe and reliable.

5.9. Instruments, Systems, and Displays. The following identifies Flight Instrument, Systems, and Display presentations requirements for Category I and Category II operations:

Instruments, Systems, and Displays for Category I.

1) Attitude indicators, EADI's or primary flight displays must be provided for each required pilot (PF and PNF), or equivalent electro-mechanical instruments depicting attitude, barometric altitude, airspeed, and vertical speed.

2) HSIs, EHSIs, NDs or other equivalent navigation displays, with pertinent, reliable and readily understandable lateral situation information for both normal and non-normal conditions related to Category I landing and missed approach procedures, must be provided for each required pilot.

3) Instrument and panel layouts must follow accepted principles of flight deck design (e.g., basic-T format, conventions for airspeed altitude scales).

4) The location and placement of situation information/navigation displays must be appropriate for each required flight crewmember, and must be appropriately scaled and readily understandable in presentations or mode of display used.

5) Suitable redundant lateral, and where applicable, vertical path displacement information from the final approach course and specified glide path must be provided.

For any operation intended for use with a DA (H) below 250' HAT, independent lateral and vertical displacement display information must be provided for each pilot on the PFD, EADI, ADI or equivalent.

For RNP operations with minima below 250' HAT, the lateral and vertical displacement full-scale indication on the PFD, EADI, or attitude indicator should be as shown in Figure 5.9.1-1, unless otherwise approved by the FAA. It is recommended that these displacement indications be provided for any RNP approach operations.

6) Decision Altitude (Height) or Minimum Descent Altitude (Height) advisory indications that are readily understandable and appropriately distinctive plus marker beacon indications (middle marker, and outer marker), or equivalent, should be provided at each required pilot station.

> **NOTE: Unless otherwise approved by the FAA, advisory indications should be expressed as "RA" for radar/radio altitude and as "BARO" for barometric altitude. Flight deck depiction of radio and barometric altitude advisories should not typically use the operational designations of "DH" or "MDA".**

7) Appropriate system status and failure annunciations suited to the guidance systems used, navigation sensors used, and any related aircraft systems (e.g., autopilot, flight director, electrical system) should be provided.

8) Automatic audio call-outs which relate to minima and radio altitude during late stages of approach and landing are recommend, as suited for the instrument approach or missed approach operations intended. If provided, the following callouts are recommended:

- "Approaching minimums",

- "Minimums",

- flare related callouts (e.g., "50"... "30"... "10"),

9) A suitable rain removal method is recommended for each pilot for Category I operations. Suitable methods typically include windshield wipers, bleed air windshield rain removal, or hydrophobic coatings.

Instruments, Systems, and Displays for Category II.

1) Attitude indicators, EADI's or primary flight displays must be provided for each required pilot (PF and PNF), or equivalent electro-mechanical instruments depicting attitude, barometric altitude, airspeed, and vertical speed plus suitable standby attitude information available to each required pilot.

2) HSIs, EHSIs, NDs or other equivalent navigation displays with pertinent, reliable and readily understandable lateral situation information for both normal and non-normal conditions related to Category II landing and missed approach procedures, must be provided for each required pilot.

3) Instrument and panel layouts must follow accepted principles of flight deck design (e.g., basic-T format, conventions for airspeed altitude scales).

4) The location and placement of situation information/navigation displays must be appropriate for each required flight crewmember, and must be appropriately scaled and readily understandable in presentations or mode of display used.

5) Suitable redundant lateral and vertical path displacement information from the final approach course and specified glide path must be provided.

Independent lateral and vertical displacement display information must be provided each pilot on the PFD, EADI, ADI or equivalent.

Lateral displacement expanded scale information must be provided to confirm that the aircraft position with respect to intended flight path and the landing runway on each PFD, EADI, ADI or equivalent (e.g., for ILS, a full scale sensitivity of 1 Dot (0.0775 ddm)), or the following criteria applicable to RNP.

For RNP operations, the lateral and vertical displacement full-scale indication on the PFD, EADI, or attitude indicator should be as shown in Figure 5.9.1-1, unless otherwise approved by FAA. It is recommended that these displacement indications be provided for any RNP approach operations.

6) An autopilot suitable for the minima to be authorized - Note: To achieve the lowest authorized minima a system with at least fail passive capability is recommended.

7) Unless otherwise approved by the FAA for Category II operations based on autopilot use alone, flight director(s), or command guidance information, should be provided for each pilot, suitable for the minima to be authorized - at least dual independent system capability must be installed for Category II operations for aircraft which are certificated with more than one required pilot.

> **NOTE: For HUD operations, availability of the information in items 1, 2 and 5 above on a HUD does not substitute for availability of this information on pertinent head-down displays.**

8) Unless otherwise approved by FAA based on demonstration of acceptable pilot workload, an autothrottle system should be provided.

9) Decision Altitude (Height) advisory indications that are readily understandable and appropriately distinctive plus a display of radio altitude and marker beacon indications (inner marker, middle marker, and outer marker), or equivalent, should be provided at each required pilot station.

> **NOTE: Unless otherwise approved by FAA, advisory indications should be expressed as "RA" for radar/radio altitude and as "BARO" for barometric altitude. Flight deck depiction of radio and barometric altitude advisories should not typically use the operational designations of "DH" or "MDA."**

10) Appropriate system status and failure annunciations suited to the guidance systems used, navigation sensors used, and any related aircraft systems (e.g., autopilot, flight director, electrical system) should be provided.

11) Automatic audio call-outs which relate to minima and radio altitude during late stages of approach and landing are recommend, as suited for the instrument approach or missed approach operations intended. If provided, the following callouts are recommended:

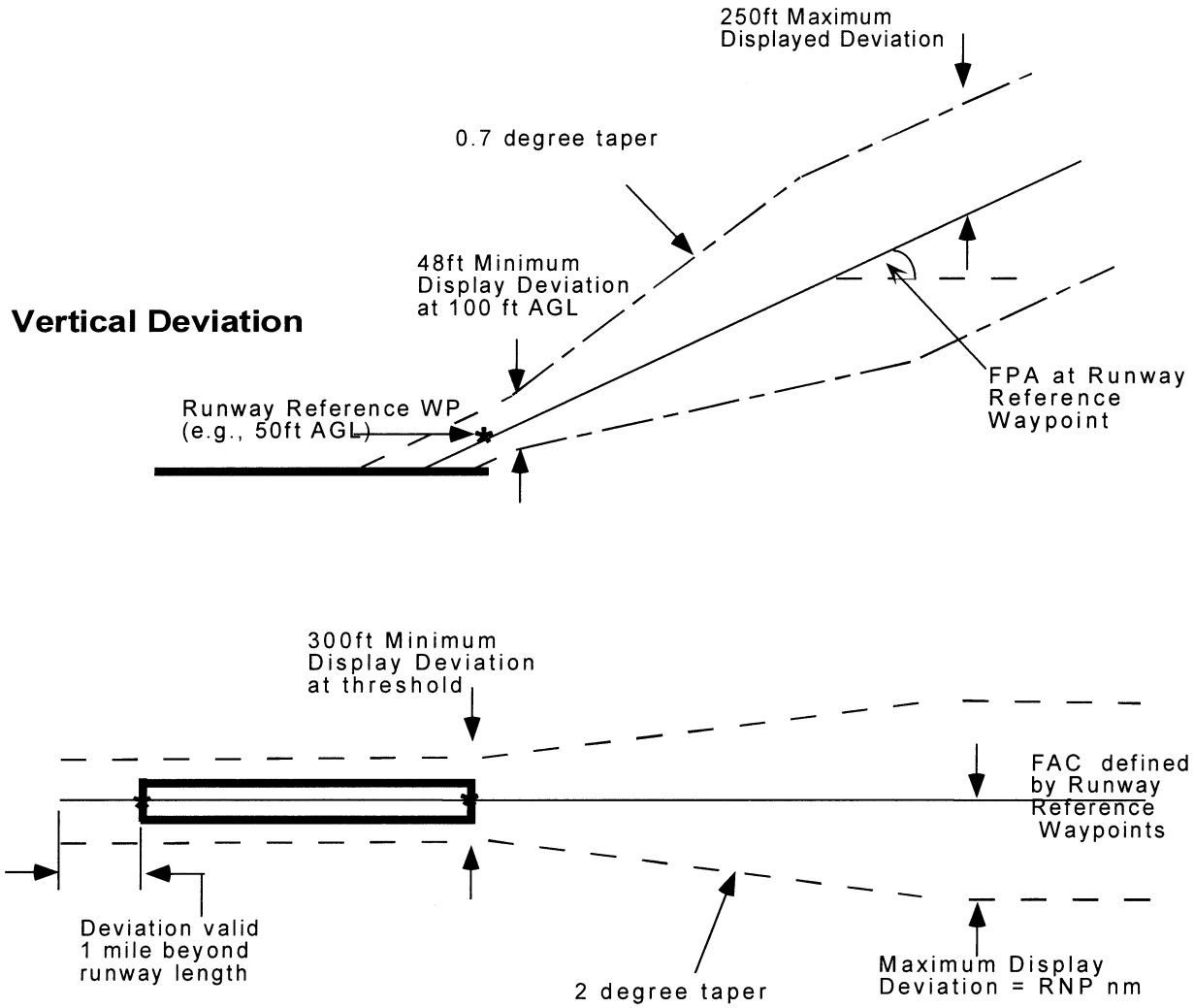
- "Approaching minimums"
- "Minimums"
- flare related callouts (e.g., "50"... "30"... "10")

12) A suitable rain removal method is required for each pilot for Category II operations.

13) A demonstration of the suitability of any indications for non-normal configurations for which credit is sought (e.g., electrical configurations, hydraulic power).

Figure 5.9.1-1

LATERAL AND VERTICAL PATH DISPLACEMENT
FULL SCALE INDICATIONS FOR RNP BASED SYSTEMS



5.10. Annunciations. Annunciations must be clear, unambiguous, and appropriately related to the flight control mode in use. The mode annunciation labels should not be identified by landing minima classification. For example, APPROACH, LAND 2, LAND 3, Single Land, Dual Land, are acceptable mode annunciation labels, whereas, "Category II", "Category III", etc., should not be used. Aircraft previously demonstrated for Category I or II which do not meet this criteria may require additional operational constraints to assure the correct use of minima suited to the aircraft configuration.

5.11. Auto Aural Alerts. Automatic Aural Alerts (automatic call-outs, voice callouts, etc.) of radar altitude, or call-outs approaching landing minimums, or call-outs denoting landing minimums are recommended and should be consistent with the design philosophy of the aircraft in question. However, any automatic call-outs used should not be of a volume or frequency that interferes with necessary flightcrew communications or normal crew coordination procedures. Recommended automatic call-outs include a suitable alert or tone as follows:

1. At 500 feet (radar altitude), approaching minimums and at minimums, and

2. Altitude call-outs during flare, such as at "50" feet, "30" feet and "10" feet, or altitudes appropriate to aircraft flare characteristics.

Low altitude radio altitude call-outs, if used, should appropriately address the situation of higher than normal sink rate during flare, or an extended flare which may be progressing beyond the touchdown zone. Other alerts may be used when approved by the Administrator, if those alerts are consistent with that operators approved procedures and minima, and do not impair crew communication.

5.12. Navigation Sensors (xLS) - ILS, GLS, or MLS. For ILS, GLS, or MLS various navigation sensors individually may be acceptable to support Category I or II operations. ILS localizer and glideslope signals are the primary means currently used for the determination of deviation from the desired path for lowest Category I or II operations. Criteria for acceptable ILS and MLS localizer and glide-slope receivers are included in Appendix 2 or 3 or in earlier acceptable criteria used by FAA for previous demonstrations of systems for Category I or II.

Other navigation sensors, such as GNSS, or DGNSS, may be used individually or in combination to satisfy the necessary accuracy, integrity and availability for Category I or II. Navigation sensors other than ILS must meet equivalent ILS performance or appropriate RTCA or EUROCAE criteria for lowest Category I minima credit, unless otherwise authorized.

Appropriate marker beacon information, or equivalent, must be displayed to each pilot for the outer, middle and inner markers. The FAA may authorize appropriate substitutes for marker beacons for Category I or II based upon the use of suitable GNSS/DGNSS capabilities, or DME.

At least 1 ADF must be available for ILS procedures, unless an approved RNAV capability providing equivalent or better performance is available.

Note: PAR may also be considered to be acceptable for Category I or II.

Approaches other than ILS, GLS, or MLS. For approaches other than ILS, GLS, or MLS, the following sensors are considered to be acceptable for providing course guidance for Category I Operations (Note: Category II operations are not authorized exclusively using these sensors.):

- LOC
- LDA
- SDF
- BCRS
- RNAV (e.g., FMS)
- GPS
- VOR
- VOR/DME
- TACAN
- NDB
- NDB/DME
- Dual NDB
- ASR

- KRM (RMS)

5.13. Supporting Systems and Capabilities.

5.13.1. Flight Deck Visibility. Suitable forward and side flight deck visibility for each pilot should be provided as follows:

a. The aircraft should have a suitable visual reference cockpit cutoff angle over the nose for the intended operations, at the intended approach speeds, and for the intended aircraft configurations, as applicable (e.g., flap settings),

b. The aircraft's flight deck forward and side windows should provide suitable visibility for taxi and ground operations in low visibility, and

c. Placement of any devices or structure in the pilot's visual field which could significantly affect the pilot's view for low visibility operations must be acceptable (e.g., HUD drive electronics, sunvisor function or mountings).

5.13.2. Rain and Ice Removal. Suitable windshield rain removal, ice protection, or defog capability should be provided as specified below:

a. Installation of rain removal capability is recommended for Category I and required for Category II (e.g., windshield wipers, windshield bleed air).

b. Installation of use of windshield hydrophobic coatings, or use of equivalent rain repellent systems which meet pertinent environmental standards are recommended.

c. Installation of windshield anti-ice or de-ice capability is recommended for Category I and required for Category II for aircraft intended to operate in known icing conditions during approach and landing.

d. Installation of at least forward windshield defog capability is recommended for aircraft subject to obscuration of the pilot's view during humid conditions.

Aircraft subject to obscuration of the windshield due to rain, ice, or fogging of the pilot's view which do not have protection, or which do not have adequate protection may require operational limitations on the conditions in which low visibility operations are conducted.

5.13.3. Miscellaneous Systems. Other supporting systems including instruments, radar altimeters, air data computers, inertial reference units, instrument switching, or capabilities such as flight deck night lighting, landing lights and taxi lights, position, turnoff, and recognition lights, flight data recorders, cockpit voice recorders or other low visibility related aircraft systems must meet any appropriate criteria as specified in Appendix 2 or 3, in basic airworthiness requirements applicable to U.S. certificated aircraft or equivalent, or acceptable earlier criteria authorized by FAA for aircraft previously demonstrated to be acceptable for Category I or Category II operation (See sections 5.20. and 5.21. for GPWS, EGPWS and FDR provisions).

5.14. Go-Around Capability. For aircraft authorized for instrument approaches, and particularly for aircraft intended for operation to Category II minima, evaluation of go-around capability should be based on both normal and any specified non-normal operations, down to the lowest minima expected. Assessment should account for factors related to aircraft geometric limitations (e.g., body attitude and potential for tail strike) during the transition to go around, limited visual cues, autoflight system mode switching and any other pertinent factors identified by FAA. For aircraft in which a go-around from a very low altitude may result in an inadvertent touchdown, the safety of such a procedure should be established considering its effect on related systems, such as operation of autospoilers, automatic braking systems, autopilot/flight director mode switching, autothrottle operation and mode switching, reverse thrust initiation and other systems associated with, or affected by, a low altitude go-around.

If an automatic go-around capability is provided, it should be demonstrated that a go-around can be safely initiated and completed from any altitude to touchdown. If the automatic go-around mode can be engaged at or after touchdown, it should be shown to be safe. The ability to initiate an automatic go-around at or after touchdown is not required.

Regardless of the flight guidance system used, availability of an appropriate go-around mode/capability is required. The go-around mode/capability must be able to be selected at any time during the approach to touchdown. The go-around mode/capability should provide information for a safe discontinuance of the approach at any point to touchdown, if activated prior to touchdown. If activated at a low altitude where the aircraft inadvertently touches the ground, the go-around mode should provide adequate information to accomplish a safe go around and not exhibit unsafe characteristics as a result of an inadvertent touchdown. Inadvertent selection of go-around after touchdown should have no adverse effect on the ability of the aircraft to safely rollout and stop.

The following factors should typically be considered when evaluating the safety of go-arounds from any point in the approach before touchdown:

1) Go-around capability should address normal operating conditions, and may include specified non-normal conditions (e.g., engine out) down to the lowest expected operating minimum.

2) Factors related to any geometric limitations (such as tail strike) or configuration changes (such as flap retraction, or allowing for any necessary acceleration segment) of the aircraft during the transition to a go-around should be considered.

3) Factors such as the autopilot, flight director, or autothrottle mode switching or automatic disconnect, minimizing altitude loss during transition to a go-around, and addressing any adverse consequences that might result from autopilot, flight director or autothrottle malfunction should be considered.

4) If a go-around could result in an inadvertent touchdown, the safety of such an event should be considered. The aircraft design and/or procedures used should accommodate relevant factors. Examples of relevant factors to consider include operation and acceleration characteristics of engines, failure of an engine, the operation of autothrottle, autobrakes, autospoilers, autopilot/flight director mode switching, and other systems (e.g., ground sensing logic) which could be adversely affected by an inadvertent touchdown.

5) If the occurrence of any failure condition in the aircraft or its associated equipment could preclude a safe go-around from low altitude, then such failure conditions should be identified. In such a case, a minimum height may be specified from which a safe go-around was demonstrated if the failure occurs. If the failure occurs below the specified height, pilots should be made aware of appropriate procedures to be used, and the effects or consequences of any attempt to go-around.

Information must be provided to the flightcrew concerning appropriate procedures for low altitude go-arounds and the height loss expected. If the conduct of certain approach and landing operations is authorized with an engine-out, height loss information for engine-out operations may also be provided to the flightcrew.

5.15. Excessive Deviation Alerting. Some method is recommended for being able to detect excessive deviation of the aircraft laterally and vertically during approach, and laterally during rollout, as applicable. The method used should not require excessive workload or undue attention. This provision does not require a specified deviation warning method or annunciation, but may be addressed by parameters displayed on the ADI, EADI, or PFD. When a dedicated deviation warning is provided its use must not cause excessive nuisance alerts.

5.16. Rollout Deceleration Systems or Procedures for Category I or II.

5.16.1. Stopping Means. A means to determine that an aircraft can be reliably stopped within the available length of the runway is recommended for any operation.

5.16.2. Antiskid Systems. Unless otherwise determined to be acceptable to the FAA, aircraft authorized for Category II should have an operable anti-skid system installed and operative per the applicable FAA MMEL and MEL.

The authorization for aircraft to operate using Category II minima without anti-skid is determined by the POI for each aircraft type, considering the following factors:

1. Extra field length margin of runways to be authorized, compared with field lengths required for the aircraft type, and

2. The braking system characteristics of the aircraft regarding susceptibility to tire failure during heavy braking, and susceptibility to tire failure during operations with reduced or patchy runway surface friction.

5.17. Engine Inoperative Category II Capability. Low visibility landing minima are typically based on normal operations. For non-normal operations, flightcrews are expected to take the safest course of action to resolve the non-normal condition.

In certain instances, sufficient aircraft system redundancy may be included in the aircraft design to permit use of an alternate configuration such as, permitting an engine inoperative capability for initiation of a Category II approach.

Use of an alternate "engine inoperative" configuration presumes that the engine non-normal condition is an engine failure that has not adversely affected other aircraft systems, such as hydraulic systems, electrical systems or other relevant systems for Category II that are necessary to establish the appropriate flight guidance configuration.

An alternate engine inoperative configuration also assumes that catastrophic engine failure has not occurred which may have caused uncertain, or unsafe collateral damage to the airframe, or aerodynamic configuration. Approved alternate configurations as specified in AFM provisions may be used without exercising emergency authority (section 91.3).

In instances when AFM or operational criteria is not met, and a Category II approach is necessary, because it is the safest course of action, (e.g., in flight fire), crews may use their emergency authority to the extent necessary to conduct an approach in weather conditions less than Category I.

There are four general situations related to an engine inoperative Category II approach, and each are treated differently regarding approach authorization:

1. The first situation involves planning for an engine inoperative Category II approach in conjunction with the dispatch of an aircraft. It involves designation of Category II capability at destination or alternate airports, and decisions about appropriate fuel reserves for planning purposes for landing at the destination, or for use at takeoff, en route or landing alternate airports. This includes the cases of planning for progressive re-dispatch (PRD) or en route alternate airports related to operations such as extended operations with twin engine aircraft (ETOPS). The result of this planning is usually to identify the weather conditions necessary to list an airport as a suitable alternate.

2. The second situation is the case where a planned operation is conducted, without respect to engine inoperative Category II minima, but an engine fails en route (e.g., from the time that the aircraft has left the vicinity of the takeoff airport or takeoff alternate airport until the time that the aircraft has arrived at the final approach fix of the destination airport). This situation involves the crew's decision to consider demonstrated engine inoperative Category II capability in their decision to divert or continue to their destination.

3. The third situation is where the engine fails during the approach after passing the final approach fix, but prior to reaching the Decision Height. This situation involves the crew's decision to continue the approach, abandon the approach to begin another approach after assessing the situation and perhaps re-trimming the aircraft, or diverting to an airport with better weather.

4. The fourth situation is where the engine fails during the approach but after passing the Decision Height. This situation involves the crew's awareness of any precautions that must be taken to land or go-around following the engine failure.

Sections 5.17.1 through 5.17.5 provide criteria for Category II operations addressing each of these situations.

The following criteria are applicable to aircraft systems intended to qualify for "engine inoperative Category II" authorizations:

1. The non-normal or normal sections of the AFM must suitably describe demonstrated performance for the engine inoperative configuration, and the aircraft must meet pertinent criteria otherwise required for all-engine Category II or equivalent criteria. Exceptions to criteria may be authorized as follows:

a) The effects of a second engine failure when conducting Category II operations with an engine inoperative need not be considered, except for a demonstration that the airplane remain controllable when the second engine fails,

b) Crew intervention to re-trim the aircraft to address thrust asymmetry following engine loss may be permitted,

c) Alternate electrical and hydraulic system redundancy provisions may be acceptable, as suited to the type design (bus isolation and electrical generator remaining capability must be suitable for the engine out configuration etc.),

d) Requirements to show acceptable approach or approach and landing performance may be limited to demonstration of acceptable performance during engine out flight demonstrations (e.g., a safe landing on the runway).

e) Approach system or approach and landing system "status" should accurately reflect the aircraft configuration and capability.

2. Suitable information must be available to the flightcrew at any time inflight, and particularly at the time of a "continuation to destination" or "diversion to alternate decision." This is to determine that the aircraft can have an appropriate Category II approach capability when the approach is initiated (e.g., Non-normal checklist specification of expected configuration during approach, approach system or autoland status annunciation of expected capability)

3. Performance should be demonstrated in appropriate weather conditions considering winds and any other relevant factors.

5.18. Special Airports with Irregular Pre-Threshold Terrain. Not withstanding the fact that most aircraft systems that have completed airworthiness demonstrations consider irregular terrain in the pre-threshold area, special operational evaluations are nonetheless appropriate for certain airports having difficult pre-threshold terrain conditions. These special evaluations consider each particular aircraft type, the particular flight control system, and may include consideration of particular system elements such as the type of radar altimeters installed or other equipment. The need for such a special evaluation is the part 97 approach procedure of FAA order 8400.8 as amended. Criteria for the evaluation of irregular Pre-threshold terrain airports is contained in FAA AC 120-28D Appendix 8.

5.19. Airborne System Evaluation and Approval. Category I and Category II airborne systems may be evaluated in accordance with the applicable airworthiness criteria contained in Appendix 2 or 3 during type certification approval or they may be evaluated in conjunction with a FAA-approved program with an air carrier. To be acceptable for Category II landing minima, the airborne equipment should meet the criteria in Appendix 3 of this AC and enable Category II operations in accordance with the operational concepts discussed in paragraph 9 above. However, if a determination of compliance with Appendix 3 has not been made, airborne equipment which is demonstrated to meet the operational demonstration criteria in subparagraph 5.19.1 below may also be acceptable for Category II landing minima if it is demonstrated that this equipment also enables Category II operations in accordance with the operational concepts discussed in paragraph 4 above.

5.19.1. "Operator Use Suitability" Demonstration.

a. **Applicability.** The following criteria apply to applicants desiring Category II airborne equipment approvals for those systems which do not have a statement in the approved airplane flight manual which indicates that the equipment meets the Category II performance standards of this AC, subsequent editions, or equivalent criteria. These criteria are not intended or appropriate for those systems which include a statement in the approved airplane flight manual indicating that the equipment meets the performance standards of AC 120-29, current version.

b. **Airborne Equipment Operational Validation**. The applicant should provide an acceptable test and evaluation plan which establishes satisfactory performance of the flight guidance system for Category II operations. To be acceptable, the applicant should conduct at least 300 approaches to 100 feet in each aircraft type, except that if additional aircraft types are configured with the same basic flight guidance system, the additional approaches may be reduced by one-half. These approaches may be accomplished in line operations or during training and demonstration flights or any combination thereof. Eighty-five percent of the total demonstrations conducted during line operations should be successful and 90 percent conducted during training or demonstration flights should be successful. (See subparagraph 11b (8) (ii) (C) for a definition of a successful approach.) Approaches are to be accomplished in accordance with the following:

(1) A minimum of three facilities/runways should be used during the demonstrations and at least 10 percent of the total approaches should be conducted on each of at least three of the facilities selected. The number of approaches conducted on additional facilities can be at the applicant's discretion.

(2) The low approaches should be accomplished using facilities approved for Category II. However, at the applicant's option, demonstration may be made using facilities used only for Category I.

(3) No more than 15 approaches per day should be conducted on a single facility.

(4) No more than 60 percent of the approaches should be conducted in any single aircraft.

(5) Where an applicant has different models of aircraft within a given type which utilize the same basic flight-control guidance system, the applicant should assure that the various models comply with the basic system performance criteria.

(6) A representative number of pilots assigned to an aircraft type are to be used in the conduct of these approaches. No single pilot in command should perform more than 15 percent of these approaches except when the total number of crews located at a small domicile requires a greater percentage.

(7) At least 30 percent of the approaches should be observed by FAA Aviation Safety Inspectors.

5.19.1.1. Data Collection During Airborne System Evaluation. Each applicant is to develop a form to be used by the flightcrews to record data listed below. This form is completed whenever an approach is attempted using the airborne flight guidance system regardless of whether it is initiated, abandoned or concluded successfully. The completed forms should be provided to the FAA certificate-holding office for further evaluation. These forms should document at least the following situations:

(1) If unable to initiate approach due to a deficiency in the airborne equipment, state the deficiency.

(2) If approach is abandoned, give the reasons and altitude above runway at which approach is discontinued.

(3) Adequacy of speed control at the 100 foot point.

(4) Was the airplane in trim at the 100 foot point for continuation to flare and landing?

(5) Evaluate the compatibility of flight director when coupled.

(6) Flightcrew should indicate the position of the airplane at the 200 foot point, the 100 foot point and the estimated touchdown point using a diagram of cockpit display and diagram of runway extended to middle marker.

(7) Evaluate the quality of overall system performance.

NOTE: If the FAA certificate-holding office concurs, unsuccessful approaches attributed to ATS instructions may be excluded from the statistical data; for example, flights vectored too close in for adequate localizer and glide slope capture and ATS requests to abandon approach. Also, unsuccessful approaches may be excluded from consideration if it can be established that they are due to faulty ground station signals or where a pattern of such faulty performance can be established.

5.19.1.2. Definition of a Successful Approach. For the purpose for the airborne equipment operation validation, a successful approach is one in which, at the 100 foot point:

(1) The airplane is in trim so as to allow for continuation of normal approach and landing.

(2) The indicated airspeed and heading are satisfactory for a normal flare and landing. Indicated air speed does not exceed $\pm$ 5 knots of planned approach airspeed but may not be less than computed threshold speed.

(3) The airplane is positioned so that the cockpit is within, and tracking so as to remain within, the lateral confines of the runway extended.

(4) Deviation from glide slope does not exceed $\pm$ 75 microamps (1/2 scale) as displayed on the ILS indicator.

(5) No unusual maneuvers or excessive attitude changes occur after leaving the middle marker.

5.20. GPWS or EGPWS Interface.
Airborne equipment used for approach should have appropriate interfaces with or compatibility with GPWS and EGPWS. This is to assure nuisance free operation at routine airports. Special procedures may be used for non-normal procedures or at airports with unusually difficult underlying terrain, or other such factors.

5.21. Flight Data Recorder (FDR) Interface.
Airborne equipment used for approach should have appropriate interfaces with or compatibility with flight data recorders, and if applicable cockpit voice recorders (e.g., alerting audio audibility on CVR).

6. PROCEDURES.

6.1. Operational Procedures. Appropriate operational procedures based on the approved operator program should be addressed. Operational procedures should consider the pilot qualification and training program, airplane flight manual, crew coordination, monitoring, appropriate takeoff and landing minima including specification of either a DA (H) or MDA (H), as applicable, for landing, crew call-outs, and assurance of appropriate aircraft configurations. Suitable operational procedures must be implemented by the operator and be used by flightcrews prior to conducting low visibility Category I or II landing operations.

6.1.1. AFM Provisions. The operator's procedures for low visibility takeoff or Category I or II landing should be consistent with AFM provisions specified during airworthiness demonstrations. Adjustments of AFM procedures consistent with operator requirements are permitted when approved by the POI. Operators should assure that no adjustments to procedures are made which invalidate the applicability of the original airworthiness demonstration.

6.1.2. Crew Coordination. Appropriate procedures for crew coordination should be established so that each flight crewmember can carry out their assigned responsibilities. Briefings prior to the applicable takeoff or approach should be specified to assure appropriate and necessary crew communications. Responsibilities and assignment of tasks should be clearly understood by crewmembers. Tasks should be accomplished consistent with the AFM provisions for the aircraft and each crewmember position unless otherwise approved by the POI (duties of each pilot, monitored approach, etc.).

operating to safely conduct the approach and missed approach. Where approved substitutions are approved for U.S. operators (e.g., FMS based RNAV for NDB, VOR, or DME, or GPS for NDB) the operator should assure flight crews are familiar with substitutions allowable for that region, state or procedure.

6.2.16 "U.S. TERPS" or "ICAO PANS-OPS" Obstacle Clearance Procedural Protection Limitations
The operator should be aware that U.S. Standards for Terminal Instrument Procedures (TERPS) and "ICAO PANS-OPS" based instrument procedures principally address normal operations, including flight above DA (H) or MDA (H), and above any specified or assumed climb gradients. Operations in non-normal configurations or at unusual speeds (e.g., operations with an engine inoperative, particularly for twin engine aircraft, or in unusual flap or flight control configurations) do not necessarily assure compliance with climb gradients assumed for TERPS or PANS-OPS based standard procedures. Accordingly operators, flightcrews and dispatchers (if applicable) should consider any necessary aircraft type specific or weight/altitude/temperature (WAT) specific procedures (e.g., similar to "T-Procedures" for takeoff) that may be necessary to assure safe obstacle clearance, for at least the following situations:

1) Engine failure prior to initiation of or during approach or missed approach,
2) Balked landing or go-around from below DA (H) or MDA (H) (e.g., as for inadvertent loss of visual reference)
3) Any special precautions that may be needed if a crew follows a published missed approach procedure or ATS instruction for a turn from below DA (H) or MDA (H), and before climbing to a safe altitude protected by the procedure or MVA,
4) Any necessary consideration of an associated "IFR departure procedure" as an aid to assure safe obstacle clearance, if initiating a go-around from below DA (H), MDA (H), or during a circling approach,
5) Any special limitations that may be necessary for safe operations into FAR121.445 designated airports. (e.g., Reno, NV [KRNO]).

7. TRAINING AND CREW QUALIFICATION. Training and crew qualification programs pertinent to Category I, Category II, or lower than standard takeoff minima should include appropriate ground training (e.g., knowledge assurance) and flight training (e.g., skill or maneuver experience in simulation or an aircraft) to assure safe aircraft operation for instrument procedures and low visibility operations in normal, rare normal (e.g., winds, turbulence, restricted visibility), and specified non-normal conditions (e.g., engine or various systems inoperative). Although training is not required for part 125, operators are encouraged to prepare a training and qualification program for all crewmembers in accordance with this section.

This is typically accomplished through appropriately addressing initial qualification, recurrent qualification, upgrade qualification, differences qualification, recency of experience, and re-qualification. The operators program should provide appropriate training and qualification for each pilot in command, second in command and any other pilot or flight crewmember expected to have knowledge of or perform duties related to Category I or Category II landing operations (e.g., Flight engineer, augmented crewmember).

Pilots in command (PIC) are expected to have comprehensive knowledge of areas described in section 7.1 below and have successfully demonstrated necessary skills in accomplishing designated maneuvers or procedures for which they are expected to perform in normal or specified non-normal line operations (e.g., typically demonstrated through simulation training or evaluations).

Pilots other than the PIC should have comprehensive knowledge and similar maneuver/procedure skills as specified for the PIC, except that they may only be expected to perform those relevant duties, procedures or maneuvers applicable to their own crew position or assigned duties.

7.1. General Knowledge (Ground) Training for All Weather Operations (AWO). Appropriate ground training should be conducted suitable for the "All weather Operations", instrument procedures, aircraft type(s) or variants, crew positions, airborne systems, NAVAIDs, and ground systems used.

Topics should be addressed to include at least those listed in sections 7.1.1 through 7.1.3 below, and be addressed or tailored to suit application to initial qualification, recurrent qualification, re-qualification, upgrade or differences qualification, as applicable.

operating to safely conduct the approach and missed approach. Where approved substitutions are approved for U.S. operators (e.g., FMS based RNAV for NDB, VOR, or DME, or GPS for NDB) the operator should assure flight crews are familiar with substitutions allowable for that region, state or procedure.

6.2.16 "U.S. TERPS" or "ICAO PANS-OPS" Obstacle Clearance Procedural Protection Limitations
The operator should be aware that U.S. Standards for Terminal Instrument Procedures (TERPS) and "ICAO PANS-OPS" based instrument procedures principally address normal operations, including flight above DA (H) or MDA (H), and above any specified or assumed climb gradients. Operations in non-normal configurations or at unusual speeds (e.g., operations with an engine inoperative, particularly for twin engine aircraft, or in unusual flap or flight control configurations) do not necessarily assure compliance with climb gradients assumed for TERPS or PANS-OPS based standard procedures. Accordingly operators, flightcrews and dispatchers (if applicable) should consider any necessary aircraft type specific or weight/altitude/temperature (WAT) specific procedures (e.g., similar to "T-Procedures" for takeoff) that may be necessary to assure safe obstacle clearance, for at least the following situations:

1) Engine failure prior to initiation of or during approach or missed approach,
2) Balked landing or go-around from below DA (H) or MDA (H) (e.g., as for inadvertent loss of visual reference)
3) Any special precautions that may be needed if a crew follows a published missed approach procedure or ATS instruction for a turn from below DA (H) or MDA (H), and before climbing to a safe altitude protected by the procedure or MVA,
4) Any necessary consideration of an associated "IFR departure procedure" as an aid to assure safe obstacle clearance, if initiating a go-around from below DA (H), MDA (H), or during a circling approach,
5) Any special limitations that may be necessary for safe operations into FAR121.445 designated airports. (e.g., Reno, NV [KRNO]).

7. TRAINING AND CREW QUALIFICATION. Training and crew qualification programs pertinent to Category I, Category II, or lower than standard takeoff minima should include appropriate ground training (e.g., knowledge assurance) and flight training (e.g., skill or maneuver experience in simulation or an aircraft) to assure safe aircraft operation for instrument procedures and low visibility operations in normal, rare normal (e.g., winds, turbulence, restricted visibility), and specified non-normal conditions (e.g., engine or various systems inoperative). Although training is not required for part 125, operators are encouraged to prepare a training and qualification program for all crewmembers in accordance with this section.

This is typically accomplished through appropriately addressing initial qualification, recurrent qualification, upgrade qualification, differences qualification, recency of experience, and re-qualification. The operators program should provide appropriate training and qualification for each pilot in command, second in command and any other pilot or flight crewmember expected to have knowledge of or perform duties related to Category I or Category II landing operations (e.g., Flight engineer, augmented crewmember).

Pilots in command (PIC) are expected to have comprehensive knowledge of areas described in section 7.1 below and have successfully demonstrated necessary skills in accomplishing designated maneuvers or procedures for which they are expected to perform in normal or specified non-normal line operations (e.g., typically demonstrated through simulation training or evaluations).

Pilots other than the PIC should have comprehensive knowledge and similar maneuver/procedure skills as specified for the PIC, except that they may only be expected to perform those relevant duties, procedures or maneuvers applicable to their own crew position or assigned duties.

7.1. General Knowledge (Ground) Training for All Weather Operations (AWO). Appropriate ground training should be conducted suitable for the "All weather Operations", instrument procedures, aircraft type(s) or variants, crew positions, airborne systems, NAVAIDs, and ground systems used.

Topics should be addressed to include at least those listed in sections 7.1.1 through 7.1.3 below, and be addressed or tailored to suit application to initial qualification, recurrent qualification, re-qualification, upgrade or differences qualification, as applicable.

Topics should be addressed for each PIC and any other pilots having assigned duties (e.g., SIC) as a PF or PNF during conduct of instrument approach procedures. When duties are specifically assigned to a PF or PNF (e.g., monitored approach, Category II), only those duties applicable to the assigned crew position need be addressed for that crew position. When instrument approach related duties are specifically assigned to other than the PIC or SIC, such as a flight engineer or relief pilot duties applicable to the assigned crew position should be addressed. When flight crewmembers other than a PIC or SIC are not assigned duties associated with an instrument approach procedure but are expected to be present on the flight deck during an instrument approach, it is recommended, but not required, that they also receive suitable academic training.

Acceptable methods to address ground training topics include classroom instruction, self guided slide/tape presentation, or computer based instruction, or self-instruction using appropriate reference materials.

If the method of satisfying ground training requirements is exclusively through self guided learning or review from appropriate reference materials (e.g., flightcrew operating manual, Aeronautical Information Manual, and commercially available instrument procedure charts), the operator should use some clearly identified method (e.g., periodic written examination) to verify that each pilot has acquired or has retained the necessary knowledge.

7.1.1. Ground Systems and NAVAIDs for Category I or Category II. Ground systems and NAVAIDs are considered to include characteristics of the airport, electronic navigation aids, lighting, marking and other systems (e.g., RVR) and any other relevant information necessary for safe Category I or Category II landing or low visibility takeoff operations.

The training and qualification program should appropriately address the operational characteristics, capabilities and limitations of at least each of the following:

1) NAVAIDs. The navigation systems or NAVAIDs to be used, such as the instrument landing system (ILS) with its associated critical area protection criteria, GPS Landing System (GLS), or Microwave Landing System (MLS) characteristics, as applicable, marker beacons, VOR, DME, NDB, DME, compass locators or other relevant systems should be addressed to the extent necessary for safe operations. If area navigation systems, or other non-ground based NAVAID systems (e.g., GNSS, LORAN) are used, any characteristics or constraints regarding that method of navigation or associated supporting elements (e.g., GBAS, WAAS), must be addressed.

2) Visual aids. Visual aids include approach lighting system, touch down zone, centerline lighting, runway edge lighting, taxiway lighting, standby power for lighting and any other lighting systems that might be relevant to a Category I or Category II environment, such as pilot control of lighting aids, or coding of the center line lighting for distance remaining, and lighting for displaced thresholds, land and hold short lighting, or other relevant configurations should be addressed.

3) Runways and Taxiways. The runway and taxi way characteristics concerning width, safety areas, obstacle free zones, markings, hold lines, signs, holding spots, critical area protection areas, or taxi way position markings, runway distance remaining markings and runway distance remaining signs should be addressed.

4) Meteorological Information. METARs, TAFs, visibility reporting, Transmissometers systems, including RVR locations, readout increments, sensitivity to lighting levels set for the runway edge lights, variation in the significance of reported values during international operations, controlling and advisory status of readouts, and requirements when transmissometers become inoperative. Appropriate use of Temperatures in C or F, conversion of temperatures between C and F. Appropriate use of pressure information including altimeter settings in units of HPa or inches, QNE, QNH, QFE (if applicable). Appropriate use of Transition Level and Transition Altitude. Appropriate interpretation and use of reported wind and gust information, in true or magnetic direction, as applicable to the source and circumstance.

5) NOTAMs and other aeronautical information. Facility status, proper interpretation of outage reports for lighting components, standby power, or other factors and proper application of NOTAMs regarding the initiation of Category I or Category II approaches or initiation of a low visibility takeoff.

6) Flight Planning and Flight Procedures related to Inoperative or Unsuitable NAVAIDs. When NAVAID position updating is used in support of area navigation position determination (e.g., VOR, VOR-DME, DME-DME, GNSS updating), operators and flightcrews should be aware of when and how to disable use of an unsuitable NAVAID or updating method within the airborne navigation system. This is especially true for NAVAID failure conditions that are probable to cause a significant map (position) shift (e.g., movement of a NAVAID to a new location without corresponding update of the NAVAID position in a database, significant numbers of space vehicle outages, or areas of interference).

7.1.2. The Airborne System. The training and qualification program should address the characteristics, capabilities, and limitations of each appropriate airborne system element applicable to Category I or Category II landing including the following:

1) **Flight guidance system.** The flight guidance system, including appropriate modes to be used for different circumstances or procedures
(e.g., APPROACH, HDG, V/S, LNAV/VNAV), and any associated landing system or landing and roll out system, or
go-around capability, if applicable (e.g., autopilot, autoland),

2) **Flight director system.** The flight director system, including appropriate modes to be used for different circumstances or procedures
(e.g., APPROACH, HDG, V/S, LNAV/VNAV), and including any associated landing or landing and roll out capability, or go-around capability, if applicable (e.g., HGS),

3) **Automatic throttle**. The automatic throttle control system, if applicable. Mixed mode autoflight/autothrottle operation should be addressed (e.g., manual flight, but with autothrottles on, or vice versa), if pertinent to the aircraft type,

4) **Displays**. Situation information displays, as applicable, including any applicable limits for acceptable approach performance to continue an approach, flare, rollout, or go-around (e.g., typically 1/2 dot or less lateral or vertical displacement below
500 feet HAT down to DA (H), and

5) **Status, Alerting and Warning Displays.** Other associated instrumentation and displays, as applicable, including any monitoring displays, status displays, mode annunciation displays, failure or warning annunciations and associated system status displays that may be relevant.

6) **Means for determining DA (H) or MDA (H).**
The means for determining DA (H) or MDA (H) as follows:

DA (H) as applicable to the particular Category I ILS, GLS, or MLS procedure (e.g., as an applicable DA, or Marker Beacon substitute for a DA when authorized),

DA (H) as applicable to the particular Category I RNAV or RNAV RNP procedure with VNAV (e.g., as an applicable DA),

MDA (H) as applicable to the particular Category I procedure other than ILS, GLS, or MLS (e.g., as an applicable MDA, and any associated missed approach point), and

DA (H) as applicable to the particular Category II ILS, GLS, or MLS procedure (e.g., as an applicable DH, or Marker Beacon substitute for a DH, when authorized).

7) **Other flight deck systems**. Other flight deck systems operations or use, as may be related to low visibility operations (e.g., autobrakes, autospoilers), and any associated limitations, characteristics, or constraints (e.g.,

touchdown pitchup or pitchdown tendency of certain autospoiler or autobrake settings or non-normal conditions, time delays, auto-deactivation features with go-around).

8) **Other aircraft characteristics.** Any system or aircraft characteristics that may be relevant to Category I or Category II operations, such as cockpit visibility cutoff angles and the effect on cockpit visibility of proper eye height, seat position or instrument lighting intensities related to transition through areas of varying brightness visual conditions change. Crews should be aware of the effects on flight deck visibility related to use of different flap settings, approach speeds.

9) **Lighting.** Proper use of various landing, taxi, turnoff, wing, logo, or strobe lights for approach visibility, taxi, or collision avoidance conspicuity.

10) **Rain Removal and De-fog.** Proper procedures for use of rain removal/defog (e.g., windshield wipers). If windshield defog, anti-ice, or de-icing systems affect forward visibility, crews should be aware of those effects and be familiar with proper settings for use of that equipment related to low visibility landing.

11) **Course and Frequency Selection.** For automatic or manual systems which require crew input for parameters such as inbound course or automatic or manually tuned navigation frequencies, the crew should be aware of the importance and significance of any incorrect selections or settings, if not obvious, to assure appropriate system performance.

12) **Environmental Limits.** Description of the limits to which acceptable system performance has been demonstrated for headwind, tailwind, crosswind, and wind shear as applicable, and recognition of unacceptable performance in the case of adverse weather (e.g., windshear, turbulence).

13) **Non-normal or failure conditions.** Recognition and response to pertinent non-normal or failure conditions, and related non-normal procedure and checklist use for flight guidance, instrument, and supporting systems (electrical, hydraulic, and flight control systems).

14) **Go-Around.** Proper airborne system use for go-around, including consideration of height loss during transition to a go-around, performance assurance for obstacle clearance, management of any necessary mode changes, and assurance of appropriate vertical and lateral flight path tracking.

As applicable, the operator may consult the CHDO/POI to assure that information presented by the operator about any training or qualification items or issues referenced above, or any additional issues pertinent to the type aircraft or system used, are consistent with the pertinent FAA Flight Standardization Board (FSB) Report for the applicable aircraft type.

7.1.3. Flight Procedures, Operations Specifications and Other Information.

1). **FARs and Op-Specs.** Pilots should be familiar with FAA regulations pertinent to their operation (e.g., sections 91.175, 121.651, 125.381 and 135.225) and OpSpecs applicable to Category I or Category II landing, or lower than standard takeoff minima, as applicable.

2). **Crew Duties.** Pilots should be familiar with appropriate crew duties, monitoring assignments, transfer of control during normal operations using a "monitored approach" appropriate automatic or crew initiated call-outs to be used, proper use of standard instrument approach procedures, special instrument approach procedures, applicable minima for normal configurations or for alternate or failure configurations and reversion to higher minima in the event of failures.

3). **Visibility and RVR.** Pilots should be familiar with proper application of meteorological visibility, METARs, TAFs, runway visual range (RVR), RVV (if applicable), including their respective use and limitations, the determination of controlling RVR and advisory RVR, required transmissometers, appropriate light settings for correct RVR readouts and proper determination of RVR values reported at foreign facilities. Pilots should be familiar with any authorized methods for pilot assessment and reporting of visibility at non-U.S. facilities.

4). **Procedures and Charts.** Pilots should be familiar with the proper use of instrument procedures and charts including application of DA (H) and MDA (H), and when to use DA, DH, or an equivalent (e.g., OCA (H)), or MDA as applicable, including proper use and setting of barometric or radar altimeter bugs, use of the inner marker where authorized or required due to irregular underlying terrain and appropriate altimeter setting procedures for the barometric altimeter consistent with the operators practice of using either QNH or QFE, and if applicable.

Pilots should be aware of when to make suitable cold weather temperature corrections for altimeter systems and procedures, if necessary.

5). **Visual references**. Pilots should be familiar with the availability and limitations of visual references encountered, both on approach before and after DA (H), if a DA or DH is applicable. Pilots should be familiar with the expected visual references likely to be encountered. Pilots should be familiar with procedures for an unexpected deterioration of conditions to less than the minimum visibility specified for the procedure during an approach, flare or roll out including the proper response to a loss of visual reference or a reduction of visual reference below the specified values when using a DA (H) or MDA (H) and prior to the time that the aircraft touches down. The operator should provide some means of demonstrating the expected visual references where the weather is at acceptable minimum conditions and the expected sequence of visual queues during an approach in which the visibility is at or above the specified landing minimums. This may be done using simulation, video presentation of simulated landings or actual landings, slides showing expected visual references, computer based reproductions of expected visual references or other means acceptable to the FAA.

When a synthetic reference system such as "synthetic vision" or enhanced vision systems or independent landing monitors are used, pilots should be familiar with the interpretation of the displays to assure proper identification of the runway and proper positioning of the aircraft relative to continuation of the approach to a landing. Pilots should be briefed on the limitations of these systems for use in various weather conditions and specific information may need to be provided on a site-specific basis to assure that misidentification of taxiways or other adjacent runways does not occur when using such systems.

6). **Visual Transition.** Procedures should be addressed for transitioning from non-visual to visual flight for both the pilot in command, second in command, as well as the pilot flying and pilot not flying during the approach. For systems that include electronic monitoring displays, as described in item 5 above, procedures for transitioning from those monitoring displays to external visual references should be addressed.

7). **Unacceptable Displacements.** Pilots should be familiar with the recognition of the limits of acceptable aircraft position and flight path tracking during approach, flare and if applicable roll out. This should be addressed using appropriate displays or annunciations for the aircraft type.

8). **Environmental effects**. Environmental effects should be addressed. Environmental effects include appropriate constraints for head winds, tail winds, cross winds, and the effect of vertical and horizontal wind shear on automatic systems, flight directors, or other system (e.g., HGS) performance. For systems such as head-up displays which have a limited field of view or synthetic reference systems pilots should be familiar with the display limitations of these systems and expected crew actions in the event that the aircraft reaches or exceeds a display limit capability.

Extreme temperature or pressure effects should be considered, if necessary.

9). **Operator Policies.** Pilots should be familiar with the operators policies and procedures concerning any constraints applicable to Category I or Category II landings, or low visibility takeoff including constraints for operations on contaminated or cluttered runways. Procedures to be used when obscuring of appropriate lighting or markings occurs, and limits should be noted for operations on slippery or icy runways regarding both directional control and stopping performance. Pilots should be familiar with appropriate constraints related to use of braking friction reports. Pilots should be familiar with the method of providing braking friction reports applicable to each airport having instrument landing operations.

10). **Response to aircraft or system failures**. Pilots should be familiar with the recognition and proper reaction to significant aircraft system failures experienced prior to and after reaching the final approach fix and experienced prior to and after reaching DA (H), as applicable. Expected crew response to failures prior to touchdown should be addressed, particularly for Category II operations.

11). **Ground or navigation system faults**. Pilots are expected to appropriately recognize and react to ground or navigation system faults, failures or abnormalities at any point during the approach, before and after passing DA (H) and in the event an abnormality or failure which occurs after touchdown. Pilots should be familiar with appropriate go-around techniques, systems to be used either automatically or manually, consequences of failures on go-around systems which may be used, the expected height loss during a manual or automatic go around considering various initiation altitudes, and appropriate consideration for obstacle clearance in the event that a missed approach must be initiated below DA (H).

12). **Navigation anomalies or discrepancies.** Pilots should be familiar with the need to report navigation system anomalies or discrepancies, or failures of approach lights, runway lights, touchdown zone lights, center line lights or any other discrepancies which could be pertinent to subsequent Category I or Category II operations.

13). **International Procedures.** Pilots should be familiar with any applicable international procedures including application of OCA, OCH, the applicable State AIP, or regional supplements (if not otherwise addressed by the operator in the FCOM or equivalent), pertinent excerpts from ICAO references (e.g., Manual for All Weather Operations - ICAO DOC 9365AN/910). Regulatory requirements and responsibilities at non-U.S. international airports (e.g., approach ban and "look see" provisions).

14). **Performance and Obstacle Clearance**. Pilots should be familiar with any applicable aircraft performance or weight limit information to assure safe obstacle clearance for "all engine", or "engine inoperative" missed approach, or rejected landing. Applicable performance information should consider applicable flap settings to be used, go-around procedures, acceleration segments if applicable, transition at any time following an engine failure between the specified "all-engine lateral flight path" (or radar vectors) and any specified "engine-inoperative lateral flight path", using acceptable flap retraction and cleanup height procedures.

15). **Flight Plans and Equipment Classification**. Pilots should be familiar with use of appropriate flight plan equipment classifications [e.g., Required System Performance (RSP)] affecting eligibility for various takeoff or landing procedures (e.g., flight plan /F, /E designations), and proper alternate airport identification and use, including any takeoff, en route ETOPS, or destination alternates, as applicable.

7.2. Maneuver or Procedure (Flight) Training for All Weather Operations (AWO).

a. Aircraft Or Flight Simulator Use. Maneuver/Procedure (Flight) training and evaluation should be provided, and should use appropriate simulation capability. If simulation capability is not available, training or evaluation may be accomplished partially with training devices, or partially or completely in an aircraft. However, when training or evaluation is done using training devices, or with simulators with limited capability (not Level C or D), or with an aircraft, additional factors may need to be considered, or provisions or constraints applied by the CMO/CMU or POI, as described below.

b. Addressing Applicable Regulations. Maneuver or procedure training should generally address applicable part 121 Appendix E or F provisions, an Approved AQP Program as applicable, approach and landing events specified in part 61, relevant FAA Order 8400.10 airman certification takeoff and landing provisions, FAA Order 8700.1 for FAR Part 125 competency or instrument checks, or FAA ATPC Practical Test Standards (PTS) as applicable, as described or credited below.

c. Types Of Procedures And Conditions To Be Addressed. Maneuvers and procedures trained should be keyed to the types of instrument procedures used by the operator, the environment in which they are flown, and any special considerations that may apply to their safe application. Operating policies, procedures, and documentation representative of that applicable to the particular operator should be used. Maneuver and Procedure Training and any necessary evaluation should assure that instrument procedures can be safely flown considering at least the following factors, as applicable to the specific operator:

1) Types of Instrument Procedures used (Standard and Special, if applicable),

2) That operator's manuals, charts, and checklists,

3) Aircraft type(s) and variants flown,

4) Flight guidance system(s) used,

5) NAVAID(s) and Visual aids used,

6) Flightcrew procedures used (e.g., PF/PNF duties, monitored approach, callouts),

7) Airport characteristics typically experienced (e.g., Visual aids, transition level, air traffic procedures, Met procedures, signs and markings, unusual airport features (elevations, slope) as applicable),

8) Runway characteristics typically experienced (e.g., representative field lengths, grooving, marking),

9) Nearby critical terrain or obstruction environment, if applicable,

10) Relevant environmental conditions (e.g., wind, turbulence, shear, visibility and ceiling conditions, slippery runways, rain or snow effects on visibility),

11) Lowest Category I or Category II straight-in, or Category I circling minima as applicable, and

12) Other relevant AWO characteristics (e.g., special instrument procedures).

d. Use of Part 121.Appendix H Level C or D Simulators. When simulation (e.g., part 121.Appendix H level C or D) is the primary method used for flight training or evaluation for takeoff, approach and landing procedures, appropriate normal, non-normal, and environmental conditions (relevant wind, turbulence, visibility and ceiling conditions) should be simulated. In this instance, training and evaluation need only be conducted using applicable landing minima and relevant and representative procedures and conditions (e.g., a representative mix of day, night, dusk, variable/patchy conditions, representative temperatures, landing runway altitudes, precipitation conditions, turbulence, and icing conditions). Multiple requirements for maneuvers may be combined at the discretion of the POI/APM/CMO/CMU, subject to the constraints below (e.g., to preclude the need to repeat various Category I/II/III, approach scenarios for normal approaches, approaches with an engine(s) out, missed approach, landing, rejected landing, and various go-around events). The training benefit of realistic simulation is acknowledged, and credit for use of a representative sample of conditions to be flown, directly using pertinent minima, is considered to be acceptable. Accordingly, when level C or D simulation is used, only a sample of procedural types, environmental conditions, successful crew performance, and other factors listed in c. above need be assessed. However, when such credit for combining events is permitted, the operator and CMO/CMU/POI/APM should nonetheless ensure that the program used leads to flightcrews reliably performing the necessary low visibility procedures under both normal and anticipated non-normal conditions in line service. Acceptable numbers and types of training or demonstration instrument approach procedure events for various types of training or checking or qualification programs are listed in sections 7.2.1 through 7.2.7 below.

e. Use of Simulators other than Part 121 Appendix H Level C or D, use of Training Devices, or use of an Aircraft. When part 121.Appendix H level C or D simulation (or equivalent) is not used for All Weather Operations (AWO) Qualification (e.g., when an aircraft is used, or a training device(s) level 2 through 7, or visual simulator, or non-visual simulator, or Level A or B simulator, or a simulator qualified for Level C or D but used as an FBS is used) certain restrictions and additional provisions may apply to training or qualification, as follows:

1) The POI or CMO/CMU may require that during training or evaluations the flightcrew demonstrate satisfactory lateral and vertical flight path tracking performance to a tighter tolerance than otherwise operationally required (e.g., demonstrate less than 1/2 dot localizer or glideslope sustained tracking error, or demonstrating acceptable

tracking to a lower altitude (e.g., 100" below applicable DA (H)) to assure flight path stability after passing DA(H), and to compensate for the possible lack of visual reference or external environmental disturbances that exist in real operations but that are usually minimal or absent during training or testing (e.g., due to lack of turbulence or other disturbance).

2) The POI or CMO/CMU may require that additional procedures or combinations of procedures be demonstrated, or that limitations apply to credits allowed by this AC in terms of credit for combining maneuvers or types of procedures trained, maneuvers demonstrated, or other events evaluated (e.g., for combinations of various Category I, II, III procedures for ILS, VOR, VOR/DME, NDB, Back Course Localizer, engine inoperative missed approach or landing procedures).

3) The POI or CMO/CMU may require additional training or checking event items beyond those identified in this AC below, or those addressed only generically in part 121 Appendix E or F, or in part 61 Appendix A (e.g., providing for HUD or autoland qualification where part 121 or 91 only make general reference to items like other special characteristics as necessary),

4) When using an aircraft for training or testing, the POI or CMO/CMU may require that provision be made for use of a view limiting device for any necessary competency demonstrations. This is particularly applicable to any evaluation of a pilot that has not previously qualified to fly a similar class of aircraft (e.g., large turbojet aircraft), or for a pilot that does not have significant instrument experience beyond that necessary to satisfy minimums for issuance of an FAA commercial pilot's license with instrument rating.

f. Flight Training Maneuvers for Category I or II Landings.
Maneuvers may be addressed individually as a respective Category I or Category II maneuver, or an appropriate sample of Category I and Category II maneuvers may be trained and evaluated, if crews are to be both Category I and II qualified. When flightcrews are authorized to use minima for Category III, as well as Category II, samples of maneuvers selected to be performed for training and evaluation may be from appropriate combinations of Category I, II, and III procedures. When found acceptable to the CHDO/POI, each maneuver need not be repeated for each Category of landing weather minima to be authorized.

Flight training for Category I or Category II landing should address at least the following maneuvers:

1). **Normal landings**. Normal landings at the lowest applicable Category I or Category II minima, using representative autoflight configurations or combinations of configurations authorized for use (e.g., flight director, autopilot, autothrottles),

2). **Missed approach.** A missed approach from the lowest applicable DA (H) and MDA (H), (may be combined with other maneuvers),

3). **Balked landing**. A balked landing or missed approach from a low altitude that could result in a touchdown during go-around (balked landing or rejected landing - may be combined with other maneuvers),

4). **System or Navaid Failures.** Appropriate aircraft and ground system NAVAID failures (may be combined with other maneuvers),

5). **Engine Failures**. Engine failure prior to or during approach (if specific flight characteristics of the aircraft or operational authorizations require this maneuver),

6). **Low Visibility Rollout**. Manual roll out with low visibility at applicable minima (may be combined),

7). **Realistic Environmental Conditions**. Landings (in simulation) with environmental conditions at a representative sample of limiting values authorized for applicable Category I or II minima for that operator (e.g., regarding wind magnitude, headwind and crosswind components, turbulence, and runway surface friction characteristics (wet, snow, slippery - may be combined), and

8). **Non-normal configuration approaches and landings**. Representative non-normal configuration approaches and landings in instrument conditions should be demonstrated. For these approaches, the simulated weather minima may be above, or well above, the lowest Category I or Category II minima authorized. Minima should be at levels that might typically be experienced in line operations, for a landing with the non-normal condition used. During these approaches, representative autoflight, instrument, and aircraft system configurations or combinations of configurations should be demonstrated (e.g., flight director, autopilot, autothrottles, raw data, inoperative electrical or hydraulic components).

9). **Basic Airmanship Skills.** In accomplishing items 1. through 8. above, each pilot should demonstrate competence, or be judged to have the necessary competence in "basic airmanship skills" to adequately address:

a). **Manual Control.** Manual control, or reversion to manual control of the aircraft, if necessary, (for FBW aircraft, normal law or configuration is acceptable)

b). **Automation**. Proper use of automation,

c). **Situation Awareness**. Appropriate planning and situation awareness, including terrain awareness,

d). **Detection and coping with adverse environmental factors**. Ability to detect and cope with adverse environmental conditions (e.g., applicable crosswinds, turbulence, windshear, convective weather, or adverse airport conditions (e.g., slippery runways)),

e). **Detection and coping with adverse NAVAID factors.** Detection Ability to detect and cope with adverse ground system, space system, or NAVAID failures or anomalies), and

f). **Crew coordination and CRM**. Proper crew coordination, and crew resource management.

g. Flight Training Maneuvers for Takeoffs. For low visibility takeoff (RVR less than 2400 RVR), the following maneuvers and procedures should be addressed (may be combined):

1). **Normal takeoff**,

2). **Rejected takeoff** from a point prior to V1 (including an engine failure),

3). **Continued takeoff** following failures including engine failure, and any critical failures for the aircraft type which could lead to lateral asymmetry during the takeoff, or

4). **Limiting conditions**. The conditions under which these normal and rejected takeoffs should be demonstrated include appropriate limiting cross winds, winds, gusts and runway surface friction levels authorized. A demonstration should be done at weights or on runways that represent a critical field length.

h. Demonstration Of Appropriate PF Or PNF Duties By Each Pilot. During each of the specified maneuvers or procedures, crewmembers are expected to perform their respective assignments or duties (e.g., Captain, First Officer, PIC, SIC, Pilot-Flying (PF), Pilot-Not-Flying (PNF)), as applicable. However, PICs and SICs should typically be able to perform either PF or PNF duties, unless otherwise limited by the operators policies or aircraft characteristics (e.g., if F/Os are precluded by operator policy or system installation (HUD) from serving as PF during certain adverse weather takeoffs or landings). In situations where crewmembers are being qualified other than as part of the complete flightcrew (e.g., when two pilots in command are being qualified) or when a pilot other than the PIC is also to be authorized to serve as the PF for low visibility operations, each crewmember should individually demonstrate the required maneuvers or procedures, or an acceptable sample of procedures. Relevant procedures are those involving manual control of the aircraft, rather than procedures such as autoland, which may not involve significant differences in PF or PNF skills.

7.2.1. Initial Qualification. Prior to maneuver or flight training, Initial General Knowledge (Ground) Training for "All Weather Operations (AWO)" should be addressed. Coverage of those subjects specified in 7.1 should typically be completed for each pilot having assigned AWO responsibilities.

Maneuver or Procedure (Flight) Training addressing suitable for that operator's Initial Qualification for "All Weather Operations (AWO)" should be conducted. While the number of procedure types covered, number of simulator periods, number of training flights, if any, or other factors may vary, coverage should at least address the expected initial assignment of the crewmember receiving the initial training. AWO training may be combined with the initial aircraft type qualification training program or it may be done separately as AWO qualification. Regardless, the operator is expected to provide sufficient initial training to assess knowledge and skills of each new crewmember, address any individual area of weakness, assure each crewmember can perform to applicable AQP, PTS, or other relevant standards, and assure that each crewmember can competently perform the maneuvers or procedures specified in 7.2 above.

If weaknesses are identified, it is expected that the operator will provide sufficient remedial training to assure that any new crewmember can perform to applicable FAA Commercial Pilot, Instrument, Multiengine, or ATPC standards, for the applicable aircraft type or variant, and can acceptably use that operator's policies, manuals and procedures, before releasing that crewmember to IOE or to serve in line operations.

When Category I or II minima are based on manual operations using systems like head-up displays or flight directors, a number of repetitions of the maneuvers specified in 7.2 above may be necessary to assure that each of the required maneuvers can be properly and reliably performed.

Operators should also assure that crewmembers receiving initial training have appropriate basic airmanship skills related to AWO (e.g., crosswind takeoff and landing skills, ability to fly to an adequate level using raw data, ability to assess and safely cope with adverse runway friction, make adverse weather avoidance judgments), or are provided relevant remedial training.

Guidance for acceptable programs related to a particular aircraft type can be found in FAA FSB reports for specific aircraft types. Operators should adhere to FSB guidelines when published, unless otherwise authorized by AFS 400. Sufficient assessment should take place to assure that the operator has determined that above objectives have been met for each crewmember, and that the resulting evaluation or assessment can be documented.

7.2.2. Recurrent Qualification.

1. Recurrent General Knowledge (Ground) Training for All Weather Operations (AWO). Recurrent General Knowledge (Ground) Training for All Weather Operations (AWO) should provide any remedial review of topics specified in 7.1 to assure continued familiarity with those topics. Emphasis should be place on any program modifications, changes to aircraft equipment or procedures, review of any occurrences or incidents that may be pertinent, and finally emphasis may be placed on re-familiarization with topics such as mode annunciations for failure conditions or other information which the pilots may not routinely see during normal line operations. Topics to be addressed for each pilot in command, second in command or other crewmember are those topics necessary for the performance of the assigned duties for each respective crewmember in the current assignment.

2. Recurrent Maneuver or Procedure (Flight) Training for All Weather Operations (AWO). Recurrent Maneuver or Procedure (Flight) Training for Category I or II landings and low visibility takeoffs, as applicable, should be provided to assure competency in each of the maneuvers or procedures listed in 7.2 above.

Recurrent Maneuver or Procedure (Flight) Training should be conducted using an approved simulator with an appropriate visual system. In the event that simulation is not available, recurrent flight training may be accomplished in the aircraft, as approved by the CHDO/principal operations inspector considering factors identified in Para 7.2 e.

Recurrent flight training should include at least sample applicable Category I or Category II procedures to be used, emphasizing any rare or critical procedures used by that operator which have not otherwise been flown routinely or recently by the crewmember, but which may be needed. Emphasis may be placed on any critical non-normal procedures (e.g., engine

inoperative, system failure cases), and any special emphasis procedures or items found to require attention due to in service feedback by the operator (e.g., excessively high descent rates near the surface, proper VNAV use). At least some procedures should be sampled at or near limiting adverse weather conditions (e.g., at minimum RVR or limiting wind components or with windshear, or to runways with minimum operationally used field lengths, or at critical terrain airports or at airports having operator unique special airport procedures). Repetition of maneuvers frequently accomplished successfully in line operations (e.g., normal ILS, normal autoland) may be de-emphasized by limited sampling, and limited assessments or those conditions and procedures.

Recurrent flight training maneuvers may be accomplished individually or may be integrated with other maneuvers required during proficiency training or during proficiency checking. If minima are authorized using several methods of flight guidance and control such as FMS, autopilot, flight director or head-up display, then the training program should assure an appropriate level of proficiency using each authorized mode or system. Where Category I or II minima are based on manual control using flight guidance such as provided by a headup flight guidance system, appropriate emphasis should be placed on failure conditions which a pilot does not normally experience in line operations.

When takeoff minimums below RVR2400 are approved, recurrent flight training must include at least one rejected takeoff at the lowest approved takeoff minima used, with an engine failure near but prior to V1.

Numbers of maneuvers or procedures to be performed during recurrent training or checking should be sufficient to ensure appropriate crewmember performance, but not less than the following:

1) An engine inoperative approach to a landing and a go around.

2) Appropriate aircraft or ground system NAVAID failures.

3) Approaches and landing(s) with environmental conditions at a representative sample of limiting values authorized for applicable Category I or II minima for that operator (e.g., wind components, turbulence, windshear or limiting runways or adverse runway surface friction).

4) Any special emphasis procedures or items identified by the operator or CHDO/POI.

5) A low visibility takeoff with critical performance or a suitable failure condition.

7.2.3. Qualification in conjunction with Advanced Qualification Programs (AQP). Appropriate re-qualification or recurrent qualification programs may be adjusted as necessary when incorporated in AQP or other single visit training programs. With such programs, however, each of the areas of knowledge specified by Section 7.1 and each of the areas of competency specified in Section 7.2 must be assured.

7.2.4. Re-qualification. Credit for previous Category I or II qualification in a different aircraft type or variant, or previous qualification in the same type or variant at an earlier time may be considered in determining the type of program, length of program, required maneuvers to be completed or the repetition of maneuvers for re-qualification for Category I or II operations. Any re-qualification program should assure that the pilots have the necessary knowledge of the topics specified in Section 7.1, and are able to perform their assigned duties for Category I or II or low visibility takeoff considering the maneuvers or procedures identified in Section 7.2.

For programs which credit previous Category I or II qualification in a different type aircraft, the transition program should assure that any subtle differences between aircraft types which could lead to pilot misunderstanding of appropriate characteristics or procedures in the new type must be suitably addressed.

7.2.5. Upgrade Qualification. Credit for previous Category I or II qualification in a different crew position in the same type or variant at an earlier time may be considered in determining the type of program, length of program, required maneuvers to be completed or the repetition of maneuvers for upgrade qualification for an aircraft type authorized for Category I or II operations. Any upgrade program should assure that the pilot has the necessary knowledge of the topics

specified in Section 7.1, and are able to perform the new or additional assigned duties for the new crew position for Category I or Category II or low visibility takeoff considering the maneuvers or procedures identified in Section 7.2.

7.2.6. Differences Qualification - Addressing Cockpit or Aircraft System Differences. For Category I and II programs using aircraft which have several variants, training programs should assure that pilots are aware of any differences that exist and appropriately understand the consequences of those differences. Guidelines for addressing differences can be found in FAA AC 120-53 and FSB reports applicable to a particular type.

7.2.7. Recency of Experience. Recency of experience requirements specified by section 121.439 or in accordance with AC 120-53 normally provide an assurance of the necessary level of experience for Category I or II landing or low visibility takeoff operations. In the event that special circumstances exist where crewmembers may not have exposure to particular aspects of the flight guidance system used for long periods of time beyond that permitted by section 121.439 or AC 120-53, then the operator should assure that the necessary recency of experience is addressed prior to pilots conducting Category I or II landings, or low visibility takeoff operations below RVR2400.

For FMS/RNAV or RNP approaches or automatic landing systems, pilots should specifically be exposed to use of these systems and procedures during training or checking if the crew has not otherwise conducted frequent relevant similar line operations with those systems since the previous training cycle or event.

For manual flight guidance landing or takeoff systems (e.g., HUD) a pilot flying should typically be afforded an opportunity to use such systems or procedures in the aircraft or in simulation once each 90 days. If the pilot has not otherwise had an opportunity to conduct line approaches or landings using the manual flight guidance system within the previous 90 days, a simulator refresher, recurrent training or checking event, line operational use in weather conditions better than basic VFR, flight with a check airman, or other similar method acceptable to the POI may be used to re-establish recency of experience with that system.

7.3. Checking or Evaluations.

7.3.1. Checking For Category I Qualification. Testing, checking or evaluation for Category I is basic to qualification for IFR operations, and should be accomplished in conjunction with basic aircraft type or variant qualification for each crew position. Testing or evaluation, if necessary and as necessary, should be keyed to assuring that each pilot has the necessary knowledge and skill appropriate to the type of qualification being completed (e.g., Initial, transition, upgrade, differences, or re-qualification programs) in accordance with applicable regulations (e.g., SFAR 58 Approved AQP program, part 121 appendix F, part 61, and applicable FAA ATPC Type Rating Practical test Standards). (Also see initial, transition, upgrade, or differences sections above.)

7.3.2. Checking For Category II Qualification. Specific testing or evaluation should be completed for Category II qualification. Crewmembers should demonstrate proper use of Category II related aircraft systems and correct procedures including any provisions otherwise specified by an applicable FSB report. If not otherwise addressed by Category I or Category III qualification, pilots should demonstrate proficiency in performing duties related to conduct of Category II approaches including at least the following conditions individually or in combination:

1) Normal approaches to a landing and to a go-around at or near Category II minima,

2) Approaches with related aircraft system, navigation system, or flight guidance failures,

3) Engine inoperative approaches (if authorized Engine Inoperative Category II),

4) For initial qualification for automatic systems for landing, at least one automatic landing to a full stop, and if applicable, one automatic go-around from a low approach at or after DA (H),

5) For automatic systems, for landing at least one automatic landing to a full stop, and one go-around from a low approach at, or after, decision or Alert Height,

6) For manual systems (e.g., HUD) one landing to a complete stop at the lowest applicable minima and one go-around from low altitude below DA (H) and at least one response to a failure condition during the approach to a landing or a missed approach, and

7) Recognition and proper response to representative non-normal or adverse weather situations (e.g., NOTAM, NAVAID failures, RVR decreasing below minima, ILS critical area unprotected).

7.3.3. Combined Checking For Simultaneous Category I/II or I/II/III Qualification. When qualification programs simultaneously address Category I and Category II, or Category I, II and Category III, testing events may be appropriately combined, and the FAA or operator need not repetitively test each type of approach at each landing Category.

7.3.4. Checking For Low visibility Takeoff Qualification. For new low visibility takeoff authorizations, and unless otherwise qualified for low visibility takeoff in accordance with FAA AC 120-28D, before using any takeoff minima below RVR1200, pilots should have successfully demonstrated in simulation at least one takeoff at the lowest applicable minima with an engine failure at or after V1, and one rejected takeoff with an engine failure or other appropriate failure prior to V1.

If an acceptable simulator is not available, the demonstration may be conducted in the type of aircraft to be authorized for use of takeoff minima below RVR1200. Representative failure speeds and conditions may be used that do not risk or adversely affect the aircraft or its systems (e.g., tires and brake energy). Use of a view limiting device for the pilot being evaluated is not necessary.

7.4. Experience with Line Landings. For Category II, unless otherwise specified by an applicable FSB report for the aircraft type, when a qualification program has been completed using a simulator program other than Level C or D, at least the following experience should be required before initiating Category II operations:

1. For automatic systems at least one line landing using the auto flight system approved for Category II minima should be accomplished in weather conditions at or better than Category II.

2. For manual systems such as head-up flight guidance system for Category II, the pilot in command must have completed at least ten line landings using the approved flight guidance system and procedures, in the configuration specified for Category II, at suitable runways and using suitable landing NAVAIDs.

7.5. Crew Records. The operator should assure that records suitably identify initial and continued eligibility of pilots for Category I or II operations. Records should note the appropriate completion of training and any necessary checking for both ground qualification, flight qualification, initial qualification, recurrent qualification, differences qualification, upgrade qualification, or re-qualification, or recency of experience for takeoffs or landings, or other tracked events (e.g., AQP), as applicable.

7.6. Multiple Aircraft Type or Variant Qualification. In the event that crewmembers are multiply qualified as either captain or first officer, or for performing the duties of the PIC or SIC (e.g., International relief officers), or for crewmembers dual qualified between several aircraft types or variants, appropriate training and qualification must be completed to assure that each crewmember can perform the assigned duties for each crew position and each aircraft type or variant.

For programs involving dual qualification, principal inspectors should approve the particular operators program considering the degree of differences involved in the Category I or II aircraft systems, the assigned duties for each crew position and criteria such as described in FAA AC 120-53 related to differences. If a pilot serving as second in command is not expressly restricted from performing the duties of the pilot in command during Category I or II approaches or low visibility takeoffs below 2400RVR, then that pilot must satisfactorily complete the requirements for a pilot-in-command regarding those low visibility related maneuvers specified in Section 7.2.

7.7. Interchange. When aircraft interchange is involved between operators, flight crewmembers must receive sufficient ground and flight training or qualification assessment to assure familiarity and competency with respect to the particular

aircraft system or systems of the interchange aircraft. Guidelines for differences should be consistent with those specified in AC 120-53 and any applicable FAA FSB reports.

7.8. Training Regarding Use of Foreign Airports for Category I or Category II Operations. Operators authorized to conduct Category I or II operations or low visibility takeoffs below RVR1200 at foreign airports, which require procedures or limitations different than those applicable within the United States, should assure that flight crewmembers are familiar with any meteorological reporting, airport, visual aid, NAVAID, or ATS clearance or procedure differences appropriate to operations at those foreign airports.

7.9. Initial Operating Experience (IOE)/Supervised Line Flying (SLF). Any Initial Operating Experience (IOE) or Supervised Line Flying (SLF) conducted by the operator should be consistent with and assure compliance with applicable provisions of the AWO program of the operator.

7.10. Line Checks, Route Checks, LOE, LOS, or LOFT. Any "Line Checks", "Route Checks", LOS, LOE, or LOFT (or other equivalent AQP events) conducted by the operator should be consistent with, and assure compliance with applicable provisions of the AWO program of the operator.

7.11. Special Qualification Requirements for Particular Category I Operations. Certain authorizations may require additional Category I or II training or qualification such as specified in paragraph 7.11.1 through 7.11.5 below.

7.11.1. Use of Certain RVR 1800 Authorizations based on HUD or Autoland. Use of lower than standard Category I minima based on use of HGS guidance or Autoland may be authorized. Such authorizations may be requested from the CHDO, and are approved on a case by case basis by AFS-400.

7.11.2. Use Of Lowest Category I Minima At Certain Obstacle Limited Or Restricted ILS Facilities. Operators may receive an authorization to use the lowest Category I minima at runways otherwise restricted to use higher minima due to near-in obstacles (e.g., KDTW RW21R). Such authorizations may be requested from the CHDO, and are approved on a case by case basis by AFS-400.

7.11.3. Simultaneous Operations using PRM Radar. For pilot procedures regarding Simultaneous Operations using PRM Radar, see the Aeronautical Information Manual. When these procedures are used by an operator, flightcrews should be suitably briefed on their appropriate use, and how and when to decline their use.

7.11.4. Simultaneous Operations with Converging Approaches and Coordinated Missed Approaches. Simultaneous Operations with Converging Approaches should be addressed if used by the operator. Pilots should be familiar with how to determine if such operations are in effect, how to program the procedure in the FMS, if applicable, how to determine if their aircraft can comply with an applicable missed approach clearance for that particular landing, how to determine if there are any special SIAP or airport procedures to be used, what to do in a contingency, and circumstances in which it may be appropriate to decline such a clearance.

7.11.5. Simultaneous Runway Operations (LAHSO). Simultaneous Operations with land and hold short ATS clearances (LAHSO) should be addressed if used by the operator. Pilots should be familiar with how to determine if such operations are in effect, if their aircraft can comply with a LAHSO clearance for that particular landing, how to determine if there are any special airport markings or lighting to be used, what to do in a contingency if the other aircraft does not respond as expected or cannot stop in the allocated distance, if a failure occurs on either aircraft, or if either or both aircraft must reject the landing, and circumstances in which it may be appropriate to decline such a clearance.

7.12. Special Qualification Requirements for Category II Operations at Certain U.S. Type I ILS Facilities. Qualification Requirements for Category II Operations at Certain U.S. Type I ILS Facilities requires that flightcrews be familiar with any operational aspects of the applicable OpSpecs for these special operations, the DA (H) and RVR minima to be used, required visibility reports necessary to be used, controlling visibility or RVR to be applied, lighting aids required, and any precautions necessary that may be unique to the airport or Type I ILS facility used.

7.13. Simultaneous Training and Qualification for Category I and II. Training and qualification may be completed individually for Category I and II or may be combined.

When combined Category I and Category II training is completed, pilots must clearly be aware of responsibilities for each Category of approach used, including differences in methods for determination of minima, controlling visibility or RVR, use of correct procedures and callouts for each Category, requirements for airborne equipment for initiation of approach with normal configurations, and response to typical failure cases appropriate for each Category of approach.

7.14. Simultaneous Training and Qualification for Category I, II and III. See AC 120-28D for provisions addressing Category III.

Training and qualification may be completed individually for Category I or II, or may be combined for Category I, II and III.

When combined Category I/II/III training is completed, pilots must clearly be aware of responsibilities for each Category of approach used, including differences in methods for determination of minima, controlling visibility or RVR, use of correct procedures and callouts for each Category, requirements for airborne equipment for initiation of approach with normal configurations, and response to typical failure cases appropriate for each Category of approach.

7.15. Credit for "High Limit Captains" (Reference Section 121.652, 125.379, 135.225). When authorized by the POI, credit for high landing weather minimum limits and required turbojet experience may be authorized consistent with provisions of exemptions authorized for Category I or II qualification credit. Among other provisions of the FAA exemptions, crews eligible for this credit must meet applicable provisions of Sections 7.1 and 7.2 above.

7.16. Particular Approach System/Procedure Qualification.

7.16.1. Autoland Qualification. Unless otherwise specified by FAA in OpSpecs, autoland qualification for Category I or II may be completed through use of Level A, B, C or D simulation, or by observation of an autoland during IOE. When using simulation, at least one normal autoland and one autoland with a failure or non-normal condition requiring pilot intervention or takeover should be completed.

7.16.2. Head Up Display Qualification.

a. Category I or II, or Category I and II. An acceptable list of flight training events for Category I, or Category II, or Category I and II qualification is shown below.

For qualification, the PF (usually the Captain) and PNF (usually the F/O) should each accomplish their respective duties. It is desirable but not required that the PNF receive at least some exposure to use of the HUD as PF, in order to be familiar with its operation, its characteristics, and its limitations.

Takeoffs:

Two Takeoffs (RVR at lowest authorized minima - e.g., RVR300),

One with an engine failure leading to continuation,

One with any failure leading to an RTO,

One windshear event during takeoff.

Landings:

Five for the lowest Category I or Category II qualification as applicable (three with, two without failures),

Five Missed Approaches/balked landings due to a failure,

One Circling approach (non ILS/GLS/MLS).

b. Simultaneous Category I/II/III qualification (also see AC120-28D). An acceptable list of flight training events for Simultaneous Category I/II/III qualification is shown below.

The PF / PNF should each accomplish respective duties as in a. above. In addition, it is appropriate that the PNF receive at least limited exposure to use of the HUD as PF. The number of events for the PNF, however, may be determined by the operator considering the experience and familiarity of the PNF with HUD operations.

Landings:

Two Category I (one with, one without failure),

One Category II (with or without a failure),

Five Category III (three with, two without failures),

Five Missed Approaches/balked landings due to a failure,

One Circling approach (non ILS/GLS/MLS).

7.16.3. RNAV Approach Qualification. Requirements to conduct RNAV approaches (e.g., for /E or /F qualified airplanes, or RNP qualified aircraft) that already routinely use LNAV/VNAV autoflight modes, are as follows:

1) The flightcrew must know how to properly use the applicable navigation system(s) for the particular types of approaches to be flown. This is typically addressed in training as a crewmember initially qualifies to fly a particular type or variant.

2) The flightcrew should have, know, or be able to do each of the items below.

a. Have access to the appropriate instrument chart(s) (e.g., SID, STAR, or approach plates) for the applicable procedures,

b. Know how to properly load the procedure(s) and any associated transitions, string related waypoints, address discontinuities, enter associated data (e.g., path constraints, altitude constraints, speed constraints, winds, anti-ice initiation altitudes), and

c. Know how to properly fly the procedure(s) (e.g., operate the aircraft to properly stay on the designated LNAV and VNAV path, and meet constraints, regardless of autoflight mode(s) selected for use, or unexpected mode changes or reversions).

3) The flightcrew must know how to properly apply applicable flight information (e.g., NOTAMs), if any, for the navigation system and route of flight (e.g., to properly deselect relevant NAVAIDs that are out of service, or could otherwise cause a problem such as a map shift, if they could adversely and significantly degrade nav system performance),

4) The flightcrew must know how to apply or accomplish any routine or special flight deck procedures specified by the operator for the approach type used or for the particular approach to be flown, including:

a. Tuning or setting associated radios, altimeters, radar altimeters,

b. Setting reference bugs and MCP altitudes, speeds, or headings,

c. Selecting or arming appropriate AFDS modes,

d. Performing any necessary navigation performance/map validity verification checks, using some acceptable method to the operator, to assure suitable navigation performance. Examples of acceptable verification methods typically include:

1. A crosscheck of FMS position with raw data prior to passing a FAF or FAP,

2. A crew assuring that the FMS is using an acceptable updating mode during the descent check (e.g., DD IRS (3)), and no map shift is evident prior to passing the FAF or FAP,

3. Periodically monitoring raw data nav information for consistency with RNAV position information that is displayed on the PFD or ND, or

4. Comparison of RNAV position or other parameters (e.g., radio altitude at a known waypoint or position) with other independent sources of acceptable position information (e.g., Crosscheck an LNAV path with a path depicted by radar or EGPWS, if applicable) which assures the validity of the navigation system position estimate. Crosschecking VNAV with radio altitude, if applicable.

5. Know how to verify navigation data base loads for currency, verify waypoint and critical waypoint validity, if applicable. Know how to verify appropriate levels of RNP, ANP, EPE, as applicable. Know how to verify suitable sensor performance if applicable (e.g., Acceptable IRS drift rate performance, DME-DME, VOR-DME or GPS updating)

e. Configuring the aircraft at appropriate times, or in conjunction with ATS clearances (speed intervention adjustments), and addressing or otherwise appropriately responding to related aircraft or system status annunciations, advisories, alerts, cautions or warnings.

5) The flightcrew must be familiar with any unique issues particular to a specific approach or family of approach procedures (e.g., proper use of RNP [if applicable] for each particular approach or missed approach segment, or any special flight guidance procedures or actions necessary to accomplish the procedure(s) such as with the flight director, autopilot, autothrottle, or FMS).

6) The operator must have the pertinent OpSpecs paragraph and the flightcrew must be aware of any operationally significant OpSpec provisions that relate to the procedures to be flown.

The above provisions may be addressed through initial or revised FCOM material, briefing bulletins, demonstrations, having crews accomplish typical procedures during scheduled PC/PT or AQP events, or as briefing emphasis items during IOE.

Each operator should assure that effective methods are used to implement applicable RNAV or RNAV/RNP procedures to assure that in line operations each pilot can perform assigned duties reliably, and expeditiously for each procedure to be flown, both in normal circumstances, and for probably non-normal circumstances (e.g., engine failure and other representative QRH, or equivalent, non-normals).

The best method or method(s) to be used by a particular operator to assure competency in flying RNAV or RNAV/RNP procedures may vary significantly from operator to operator. Methods, level and extent of training and checking, and recency may depending on the type of procedures used by the operator, the aircraft/FMS types and any autoflight systems used, level of familiarity or experience of crews with the FMS, autoflight, and the RNAV or RNAV/RNP procedures used, the complexity and criticality of procedures to be flown, and the environment in which the procedures are flown.

The CHDO (assigned POI/APM) may determine any credit allowed for an operator, or additional constraints determined necessary for that operator based on the above factors, and considering any provisions described in the applicable FSB report for the type.

7.16.4. Category I or II Operations with an Engine Inoperative.

Category I. For a Category I approach with inoperative engine(s), appropriate training should be completed to assure that crews can properly identify and select the nearest adequate or suitable airport (2 engine aircraft), or a safe airport (3 or more engine aircraft) pertinent to OpSpecs and Federal Aviation Regulations, and safely conduct the engine(s) inoperative landing. The flightcrews should have and demonstrate knowledge of factors influencing selection of a suitable airport for landing and safe completion of the approach considering factors such as the following:

1) Engine(or engines) inoperative aircraft configuration (e.g., degree of thrust asymmetry, appropriate flap settings, adjusted reference speeds, remaining reverse thrust capability and use),

2) Other potentially affected aircraft systems (e.g., electrical, or hydraulic),

3) Weather Conditions (winds, turbulence, ceiling and visibility, RVR, icing, windshear, crosswind or tailwind components, recency and accuracy of weather information),

4) Use of appropriate minima for the configuration and possible need for adjustment of approach and landing minima to suit the particular circumstances,

5) Special minima considerations that might be appropriate (e.g., engine-out missed approach obstacle or terrain assurance and balked landing obstacle avoidance considerations, consideration of subsequent engine failure (aircraft with more than 2 engines),

6) Selection of most favorable NAVAIDs, runway, or runway conditions (e.g., regarding braking friction, clutter),

7) Availability of emergency services,

8) Airport and procedure familiarity,

9) Nearby terrain or obstruction considerations,

10) MEL status, and

11) Crew recency of experience.

Operators should at least be familiar with, and provide the necessary training to flightcrews, to address the above factors or issues considering that an engine failure may occur during or after takeoff, while en route, prior to approach, after passing the final approach fix, at or below MDA (H) or DA (H) leading to either a landing or go-around, or during missed approach.

Category II. For Category II the factors listed above for training and qualification for Category I should be considered, and in addition the following should be addressed. For crews authorized to initiate a Category II approach with an inoperative engine either through Category II dispatch procedures or for engine failures which occur en route, appropriate training should be completed to assure that crews can properly apply the provisions of Sections 5.17.1 or 5.17.2. For airlines that do not authorize the initiation of a Category II approach with an engine inoperative as an approved procedure, crews should at least be familiar with the provisions above for Category I and provisions of Section 5.17.3,5.17.4, and 5.17.5 regarding an engine failure after passing the final approach fix.

7.16.5. Enhanced or Synthetic Vision Systems (Independent Landing Monitor). Training required for enhanced or synthetic vision systems may be specified by FAA based on successful completion of proof of concept testing, as applicable. Pertinent requirements are as specified in the applicable FSB report.

8. AIRPORTS, NAVIGATION FACILITIES AND METEROLOGICAL CRITERIA. United States and non-United States airports and runways authorizable for Category I and II are those either having published part 97 SIAPS, or as otherwise specified on the FAA AFS-400 "Category II status checklist" (FAA Order 8400.8). Requests for authorization to use other airports/runways should be coordinated with AFS-400, through the operator's CHDO.

8.1. Use of Standard Navigation Facilities. United States Category I approaches may be approved as published by part 97 SIAPS or as special procedures in OpSpecs

Category II operations may be approved on standard United States or ICAO navigation facilities as follows:

United States ILS facilities for which part 97 Category II procedures are published,

Other United States ILS facilities determined acceptable by AFS-400 for the type of aircraft equipment and minima sought,

Non-United States facilities meeting ICAO criteria (ICAO Annex 10, ICAO Manual of All Weather Operations DOC 9365/AN910, etc.) and which are promulgated for use for Category II by the "State of the Aerodrome", and

Category II operations require facilities assessed and classified at least through point D (e.g., II/T/2).

8.2. Use of Other Navigation Facilities or Methods. Category I or II operations may be approved using other types of navigation facilities or using other acceptable position fixing and integrity assurance methods, if proof of concept demonstrations acceptable to FAA are successfully completed:

Other United States facilities approvable for Category I and II (MLS, DGPS, or ILS used in conjunction with an acceptable aircraft integrity assurance system, etc.) are as determined acceptable by AFS-400, and

Non-United States ILS facilities meeting acceptable criteria other than ICAO (e.g., JAA), may be used as determined to be acceptable by AFS-400.

Operations may be approved using other types of navigation facilities or using other acceptable position fixing and integrity assurance methods, if proof of concept demonstrations acceptable to FAA are successfully completed:

Other United States facilities approvable for Category II (e.g., MLS, DGPS, Type I ILS used in conjunction with an acceptable aircraft integrity assurance system) are as determined acceptable by AFS-400, and

Non-United States ILS facilities meeting acceptable criteria other than ICAO (e.g., JAA), may be used as determined to be acceptable by AFS-400.

8.3. Lighting Systems. Lighting for Category I is as specified by Standard OpSpecs, part 97 SIAPS, or any special provisions or procedures identified in OpSpecs.

Lighting used for Category II must include the following systems, or ICAO equivalent systems, unless approved by AFS-400 (e.g., special provisions for Non-United States airports) or specific aircraft systems such as HUD or autoland:

United States Standard ALSF 1 or ALSF 2 approach lights,

United States Standard Touchdown Zone Lights,

United States Standard Runway Centerline Lights, and

United States Standard High Intensity Runway Lights.

Exceptions to the above lighting criteria may be authorized only if equivalent safety can be demonstrated by an alternate means (e.g., substitution for required approach lighting components due to use of an approved aircraft system providing

equivalent information or performance, such as use of an autoland system, head up display (HUD) with inertially augmented flight path vector display), or availability of redundant, high integrity, computed or sensor based (e.g., high resolution radar) runway information, suitably displayed to a pilot.

8.4. Marking and Signs. Marking and signs for Category I are as specified by the FAA for precision approach runways, except as otherwise authorized by AFS-400.

Airports approved for Category II must include the following runway and taxiway markings and airport surface signs, or ICAO equivalent, unless approved by AFS-400 (e.g., for Non-United States airports):

United States Standard Precision Instrument Runway Markings,

United States Standard Taxiway edge and centerline Markings, and

Runway signs, taxiway signs, hold line signs, taxiway reference point markings (if required by SMGC), and NAVAID (ILS) critical area signs and markings.

For Category II, markings and signs must be in serviceable condition, as determined by the operator or FAA CHDO. Markings or signs found in an unacceptable condition by an operator should be reported to the appropriate airport authority and CHDO. Operators should discontinue Category II use of those areas of airport facilities or runways where unsafe conditions are known to exist due to markings or signs being inadequate, until remedial actions are taken by the airport authority (e.g., snow removal, rubber deposit removal on runway touchdown zone markings or centerline markings, critical area hold line or runway centerline marking repainting, runway hold line sign snow removal).

8.5. Low Visibility Surface Movement Guidance and Control (SMGC) Plans. Surface movement guidance and control plans are recommended for operations below Category I. Where such plans are used, operators intending authorization for Category II should coordinate with the airport authority regarding the use of a SMGC plan prior to OpSpec authorization for that airport. Equivalent coordination should also be completed at non-United States airports if such a plan is used by that airport.

United States airports conducting takeoff or landing operations below 1,200 feet RVR are required to develop a Surface Movement Guidance and Control System (SMGCS) plan. SMGCS operations facilitate low visibility takeoffs and landings and surface traffic movement by providing procedures and visual aids for taxiing aircraft between the runway(s) and apron(s). Specific low visibility taxi routes are provided on a separate SMGCS airport chart. SMGCS operations also facilitate the safety of vehicle movements that directly support aircraft operations such as aircraft rescue and fire fighting (ARFF) and follow-me services, towing and marshaling.

AC 120-57 describes the standards and provides guidance in implementing SMGCS operations such as aircrew training, etc. An operator intending authorization for Category III operations should coordinate with the airport authority regarding their SMGCS plan. Equivalent coordination is also applicable at non-U.S. airports if such a plan is used by that airport.

8.6. Meteorological Services and RVR availability requirements. Standard meteorological reporting required by part 121 and 135 is acceptable for Category I.

For Category II, appropriate meteorological service (e.g., SA, FT, RS, RVR, RVV, METAR, METAF, Braking Action, NOTAM, etc., reports, as applicable) are necessary for each airport/runway intended for use by an operator for Category II, unless otherwise approved by AFS-400. Non-United States facilities should meet criteria of ICAO Doc 9365/AN910, second edition, or later, as amended.

For Category II, TDZ, MID, and ROLLOUT RVR (or a corresponding international equivalent) should be provided for any runway over 8000 ft in length. TDZ and ROLLOUT RVR should be provided for runways less than 8000 ft. Exceptions to this requirement for United States operators at United States or international locations may be approved on a case by case basis, by AFS-400, if equivalent safety can be established. Factors considered due to local circumstances may include such

issues as minima requested, landing field length requested, characteristics of prevailing local weather conditions, location of RVR sites or RVR calibration, availability of other supporting weather reports on nearby runways, etc.

Aircraft requiring a landing or takeoff distance in normal operation (using operational braking techniques) less that 4000 ft may be approved to use a single TDZ, MID, or ROLLOUT RVR report as applicable to the part of the runway used. For such operations, RVR values not used are optional and advisory, unless the aircraft operation is planned to take place on the part of the runway where a MID or ROLLOUT RVR is located.

In general the controlling RVR for Takeoff, Landing and Rollout are as follows:

i. Take-off:

Where visibility minima are applicable, visibility must be reported sufficiently close to the takeoff runway to be considered valid or applicable. The determination of acceptability, if not otherwise addressed by FAA, may be determined by the operator or CHDO. Where RVR minima are applicable, RVR must be reported, and the RVR minimum value is considered to be controlling at each relevant RVR reporting point. The RVR/Visibility representative of the initial part of the take-off may be replaced by pilot assessment. For take-off operations the relevant RVR refers to any portion of the runway that is needed for takeoff roll, including that part of the runway that may be needed for a rejected take-off.

ii. Landing:

a. Where visibility minima are applicable, visibility must be reported sufficiently close to the landing runway to be considered valid or applicable. The determination of acceptability, if not otherwise addressed by FAA, may be determined by the operator or CHDO. Where RVR is used, the controlling RVR for all Category I operations is the touchdown RVR. All other readings, if any, are advisory.

b. The controlling RVR for Category II (for Category III see AC 120-28D) is TDZ RVR or equivalent. Mid and rollout RVR are advisory, unless otherwise specified in OpSpecs.

An acceptable alternate set of OpSpecs may also provide for the following provisions, if determined appropriate by FAA, and agreed by the operator:

1) For airplanes without a rollout guidance or control system TDZ, MID, and ROLLOUT may be specified as controlling. If relevant, the minimum value for the MID may be 400-feet (125-meters) or the value of the touchdown RVR minima, whichever is lower. The value for ROLLOUT RVR, if relevant, may not be less than 250-feet (75-meters). For landing operations the relevant RVR refers to the portion of the runway that is needed for landing down to a safe taxi speed (typically below 60-knots for a large turbojet aircraft).

2) The controlling RVR for Category II operations using airplanes with a rollout or guidance control system is the TDZ RVR, all other readings are advisory.

c. "Inoperative RVR" requirements for dispatch or continuation of a particular flight operations are as specified in standard operation specifications Part C, or any special operations specification provision unique to a particular operator. Unless otherwise approved, in special OpSpecs provisions, the controlling RVR must be operating for all operations based on RVR minima.

8.6.1. Meteorological Services. Appropriate meteorological service (SA, FT, RS, RVR, RVV, METAR, METAF, Braking Action, NOTAM, etc., reports, as applicable) are necessary for each airport / runway intended for use. Non-U.S. facilities should meet criteria of ICAO Doc 9365/AN910, second edition, or later, as amended.

8.6.2. RVR Availability and Use Requirements.

8.6.2.1. RVR Availability. RVR availability requirements for touchdown zone (TDZ), mid runway (MID), and ROLLOUT RVR (or a corresponding international equivalent location) are as follows. RVR should be provided for any runway over 8000 ft in length. TDZ and ROLLOUT RVR should be provided for runways less than 8000 ft. Exceptions to this requirement for United States operators at international locations may be approved on a case by case basis, by AFS-400, if equivalent safety can be established. Factors considered due to local circumstances at non-United States airports may include such issues as: minima requested, characteristics of prevailing local weather conditions, location of RVR sites or RVR calibration, availability of other supporting weather reports on nearby runways, etc.

8.6.2.2. RVR Use. RVR use by operators and pilots is as specified in standard OpSpecs Part C (see Appendix 7). However, when approved as an exception in OpSpecs, aircraft capable of certificated landing or takeoff distance of less than 4000 ft may be approved to use a single TDZ, MID, or ROLLOUT transmissometer as applicable to the part of the runway used. For such operations, transmissometers not used are considered to be optional and advisory, unless the aircraft operation is planned to take place on the part of the runway where the MID or ROLLOUT transmissometer is located.

8.6.3. Pilot Assessment of Takeoff Visibility Equivalent to RVR. In special circumstances, provisions may be made for pilot assessment of takeoff visibility equivalent to RVR to determine compliance with takeoff minima. Provisions to authorize pilot assessed RVR is provided through OpSpecs paragraph C056. A pilot may assess visibility at the take off position in lieu of reported TDZ RVR (or equivalent) in accordance with the requirements detailed below:

1) TDZ RVR is inoperative, or is not reported (e.g., TDZ RVR inop, ATS facility is closed), or

2) Local visibility conditions as determined by the pilot indicate that a significantly different visibility exists than the reported RVR (e.g., patchy fog, blowing snow, RVR believed to be inoperative or inaccurate), and

3) Pertinent markings, lighting, and electronic aids are clearly visible and in service (e.g., no obscuring clutter), and

4) The assessment is made using an accepted method regarding identification of an appropriate number of centerline lights, or markings, of known spacing visible to the pilot when viewed from the flight deck when the aircraft is at the take-off point, and

5) Pilot assessment of visibility as a substitute for TDZ (takeoff) RVR is approved for the operator, and observed visibility is determined to be greater than the equivalent of 300 RVR (90m), and

6) A suitable report of the pilot's determination of visibility is forwarded to ATS prior to departure (if an ATS facility is available and providing ATS services).

NOTE: This is intended to provide information for other operations, and is not intended to restrict the aircraft making the report.

8.7. Critical Area Protection. Airports and runways used for Category I and II must have suitable NAVAID (e.g., ILS) critical area protection, as applicable to the ground and aircraft systems used. Procedures equivalent or more stringent than those specified in the United States AIM (FAA Order 7110.65) as amended, are required. Procedures consistent with ICAO DOC 9365/AN910 are acceptable for non-United States facilities. Where uncertainty regarding acceptability of non-United States airport procedures is a factor, operators or CHDOs should contact AFS-400 (e.g., for non United States airports and runways listed on the FAA Category II status checklist where doubt exists regarding adequacy of procedures encountered in routine operations) for follow up.

8.8. Operational Facilities, Outages, Airport Construction, and NOTAMs. For operations to be initially authorized, operations to continue to be authorized, an aircraft to be dispatched with the intention of using a facility described above, or an aircraft to continue to its destination or an alternate with the intent of completing a Category I and II instrument approach procedure, operators must consider the status of components identified in 8.1 through 8.7 above as necessary for Category I or II (NAVAIDs, standby power, lighting systems, etc.) and take appropriate action for inoperative components. The following guidelines are considered acceptable unless otherwise precluded in OpSpecs:

Outer, Middle, or Inner Marker beacons may be inoperative unless a Category I or II operation is predicated on their use (e.g., a DH is predicated on use of an Inner Marker due to irregular terrain, the aircraft system requires use of a marker beacon for proper function).

Lighting systems are in normal status except that isolated lights of an approach light, or runway light system may be inoperative; approach light components not necessary for the particular operation such as REIL, VASI, RAIL, etc. may be inoperative; lights may not be completely obscured by snow or other such contaminants if necessary for the operation (e.g., night).

Operations may be continued at airports at which construction projects affect runways, taxiways, signs, markings, lighting, or ramp areas only if the operator has determined that low visibility operations may be safely conducted with the altered or temporary facilities that are provided. In the event of uncertainty as to the suitability of facilities, the operator should consult with their CHDO.

NOTAMs for NAVAIDs, facilities, lighting, marking, or other capabilities must be appropriately considered for both dispatch, and for continued flight operations intending to use a Category I or II procedures. Operators and flightcrews must appropriately respond to NOTAMs potentially adversely affecting the aircraft system operation, or the availability or suitability of Category I or II procedures at the airport of landing, or any alternate airport intended for Category I and II.

An operator may make the determination that a NOTAM does not apply to the aircraft system and procedures being used for a particular flight if the safety of the operation can be assured, considering the NOTAM and situation.

8.9. Use of Military Facilities. Military facilities may be used for Category I and II if authorized by DOD, and if equivalent criteria are met as applicable to United States civil airports.

8.10. Special Provisions for Facilities Used for ETOPS Alternates (TBD). In addition to criteria specified above, an airport used as an ETOPS Category II engine-out alternate must meet the following criteria:

Sufficient information about pre-threshold terrain, missed approach path terrain, and obstructions must be available so that an operator can assure that a safe Category II landing can be completed, and that an engine-out missed approach can be completed from the specified DH.

Sufficient meteorological and facility status information must be available so that a diverting flightcrew can receive timely status updates on facility capability, weather/RVR, wind components, and braking action reports (if applicable), if conditions could or would adversely affect a planned Category II landing during the period of an ETOPS diversion.

For any alternate airports not routinely used by that operator's flightcrews (e.g., BIKF), sufficient information must be provided for crews to be familiar with relevant low visibility and adverse weather characteristics of that airport that might have relevance to an engine-out operation (e.g., unique lighting or markings, any nearby obstructions or frequently encountered local windshear or turbulence characteristics, meteorological report, braking report, and NOTAM interpretation, appropriate ground taxi route and gate location information, emergency services available)

8.11. Alternate Minima. Use of alternate minima are specified in Standard OpSpecs Part C paragraph C055. For applicability of "engine inoperative Category II" capability see section 10.8.

Paragraph C055 is issued to all part 121 and part 135 operators who conduct IFR operations with airplanes. This paragraph provides a three-part table from which the operator, during the initial dispatch or flight release planning segment of a flight, derives alternate airport IFR weather minimums in those cases where it has been determined that an alternate airport is required.

A. The first part of the table is for airports with at least one operational navigational facility providing a straight-in non precision approach procedure, or a straight-in precision approach procedure, or, when applicable, a circling maneuver from

an instrument approach procedure. The required ceiling and visibility is obtained by adding 400 feet to the Category I HAT or, when applicable, the authorized HAA and by adding 1 sm to the authorized Category I landing minimum, etc.

B. Special provisions for Category II and Category III engine-out capability are listed in the third part of the table for airports with at least two operational navigational facilities, each providing a straight-in precision approach, including a precision approach procedure to Category II DA (H) or Category III. The required ceiling and visibility is obtained by adding 200 feet to the respective lowest Category II or Category III touchdown zone elevation of the two approaches used and by adding RVR1200 to the lowest authorized minimum (see figure below).

8.12. Dispatch to Airports That are Below Landing Minima. In certain instances an operator may dispatch an aircraft to a destination airport even though current weather is reported to be below, or may be forecast to be below landing minima. This is to permit aircraft to begin a flight if there is a reasonable expectation that at or near the expected time of arrival at the destination airport, weather conditions are expected to permit a landing at or above landing minima.

Dispatch to such airports typically is considered acceptable if the following conditions are met:

1) All requirements are met to use the landing minima at the destination and at each alternate airport on which the dispatch is predicated (e.g., aircraft, crew, airport facilities, NAVAIDs).

2) If Alternate minima credit is applied based on availability of Category III capability, or Engine inoperative Category III capability, then each of the airborne systems otherwise applicable to use of that capability must be available at the time of dispatch (e.g. flight guidance system, anti skid, thrust reverse capability, as applicable to the aircraft type and Category III authorization for that operator)

3) ETA at the destination airport considers any necessary holding fuel that may be required while the aircraft waits for weather improvement.

4) Air Traffic conditions are considered for potential delay due to other aircraft arrivals or departures at the destination and at each alternate airport.

5) At least two qualifying alternates are available, the first of which considers the aircraft flying to the below minima intended destination, then holding for a time as determined by the operator awaiting approach or weather improvement, then flying to the closest alternate, then completing an approach and missed approach at that airport, and then flying to the second alternate and landing with appropriate reserve fuel.

8.13 Temperatures and Temperature Extremes

The operator should address appropriate flight crew and dispatch (if applicable) use of temperature in degrees C, degrees F, and conversion between C and F, if necessary. The operator should address appropriate dispatch (if applicable) use of temperature in tenths of degrees C or F, and any appropriate rounding or identification of acceptable temperature ranges or bounds, as needed.

The operator should address appropriate flight crew and dispatch (if applicable) use of procedures to compensate for extremely cold temperatures, if necessary [e.g., below -22F/-30C - See also sections 4.3.1.1 item 7), 4.3.4. c., 6.2.13, and 7.1.3. items 4 and 8].

The operator should address appropriate flight crew and dispatch procedures (if applicable) for use of temperatures near or possibly beyond the AFM range, if operations are necessary or are reasonably expected to be conducted at or near AFM limits (e.g., runway temperatures near or above 120 degrees F or near or below -54 degrees F).

8.14 Pressures and Unusually High or Low Pressures

The operator should address appropriate flight crew and dispatch procedures (if applicable) for identification of and appropriate setting and use of QNH, QNE, and QFE (if used). This should include emphasis on distinguishing appropriate use of metric versus non-metric units for altimeter settings as used by that operator (e.g., hectopascals

(HPa), millibars (MB), or inches (in)). Emphasis should be placed on assuring use of proper settings for easily confused values for altimeter settings, particularly when abbreviated settings are used in ATS radiotelephony, ATIS messages, or checklists (e.g. "altimeter 993" being mistakenly confused for 29.93 inches instead of 0993 HPa when the appropriate units are metric).

The operator should address any appropriate flight crew and dispatch procedures (if applicable) for unusually Low pressures if necessary for safe operations (e.g., unusable altitudes or flight levels of instrument procedures).

The operator should address appropriate flight crew and dispatch procedures (if applicable) for use of transition Level and transition altitude.

If applicable, the operator should address appropriate flight crew and dispatch procedures or limitations, as necessary, for use of VNAV in states using QFE for approach.

9. CONTINUING AIRWORTHINESS / MAINTENANCE.

9.1 Maintenance Program General Provisions. Unless otherwise approved by FAA, each operator should have an approved continuous airworthiness maintenance program (CAMP). The approved continuous airworthiness maintenance program should typically include any necessary provisions to address lower landing minima (LLM) or low visibility takeoff in accordance with the operator's intended operation and the manufacturers recommended maintenance program, MRB requirements or equivalent requirements, or any subsequent FAA designated requirements (e.g., ADs, mandatory service bulletins). Emphasis should be on maintaining and ensuring total system performance, accuracy, availability, reliability, and integrity for the intended operations.

9.2 Maintenance Program Requirements. The maintenance program should be compatible with an operator's organization and ability to implement and supervise the program. Maintenance personnel should be familiar with the operators approved program, their individual responsibilities in accomplishing that program, and availability of any resources within or outside of the maintenance organization that may be necessary to assure program effectiveness (e.g., getting applicable information related to the manufacturer's recommended maintenance program, getting information referenced in this AC such as service bulletin information).

Provision for low visibility operations may be addressed as a specific program or may be integrated with the general maintenance program.

Regardless whether the maintenance program is integrated or is designated as a specific program for Lower Landing Minima (LLM), the maintenance program should at least address the following:

1) Maintenance procedures necessary to ensure continued airworthiness relative to low visibility operations.

2) A procedure to revise and update the maintenance program.

3) A method to identify, record or designate personnel currently assigned responsibility in managing the program, performing the program, maintaining the program, or performing quality assurance for the program. This includes identification of any contractor or sub-contractor organizations, or where applicable, their personnel.

4) Verification should be made of the lower landing minima systems and configuration status for each aircraft brought into the maintenance or lower minimum program. Unless otherwise accepted by FAA, each aircraft should meet relevant criteria specified by the applicable aircraft manufacturer or avionics manufacturer for associated systems and equipment (e.g., Valid U.S. TC, appropriate STC records and compliance, assessment of status of any engineering orders, ADs, service bulletins or other compliance).

or 3 country (safety classification not a low visibility landing classification), and if there have been any reported problems with the operator or CAA. Evidence of the operator satisfying or being consistent with the manufacturer's recommended maintenance program should serve as evidence of an acceptable maintenance program, regardless of the capability of the CAA or the operator, unless FAA has specifically addressed maintenance requirements beyond those of the manufacturer for that aircraft type (e.g., required service bulletin compliance or Airworthiness Directive compliance related to the flight guidance system).

9.10.2 Maintenance of FAR 129 Foreign Operated U.S. "N" Registered Aircraft. Foreign operators of U.S. "N" Registered Aircraft (e.g., those operators to which section 129.14 is applicable) should have maintenance programs equivalent to that required for a U.S. part 121 operator. Use of the part 91 provisions for General Aviation are not applicable or appropriate. POI Approval of Category II OpSpecs for a part 129.14 operator may implicitly be considered to also accept the maintenance program adequacy. Accordingly, coordination between the applicable POI and PMI is necessary before part 129 OpSpec authorization is completed. FAA is ultimately the cognizant CAA for the maintenance program in this instance, if the aircraft is N registered. FAA may however, accept the oversight of the operators CAA if that CAA is judged by FAA to have equivalent processes, criteria and procedures for oversight of maintenance programs (e.g., JAA countries). The basis for any such maintenance program should be the recommended airframe manufacturer (or avionics vendor) program, considering any adjusted MRB requirements.

10. APPROVAL OF UNITED STATES OPERATORS. Approval for Category I and II is through issuance of, or amendments to, OpSpecs. The authorizations, limitations, and provisions applicable to Category I and II operations are specified in Part C of the OpSpecs. Sample OpSpecs are provided in Appendix 7.

Operations specifications authorizing reciprocating and turbopropeller-powered airplane Category I operations that use ICAO standard NAVAIDs and ASRs and PARs are normally approved by the certificate holding district office without further review and concurrence, following satisfactory completion of the pertinent items below. Category I turbojet, turbofan and propfan normally require regional flight standards review and concurrence before approval. All Category II operations and operations using NAVAIDs which are not ICAO-standard NAVAIDs (e.g., Loran C, ARA, OSAP and TLS) normally require both regional flight standards and AFS-400 review and concurrence before approval.

10.1. Operations Manuals and Procedures. Appropriate Flightcrew Operating Manuals, Aircraft Flight Manuals, Policy Manuals, Aircraft Checklists, Quick Reference Checklists, Maintenance Manuals, Training Manuals or other equivalent operator documents (as necessary), must satisfactorily incorporate pertinent Category I and II provisions prior to Category I and II approval.

a) Manuals. Prior to approval, appropriate flightcrew operating manuals, flight manuals, airline policy manuals, maintenance manuals, training manuals, and related aircraft checklists, quick reference handbooks, or other equivalent operator information, must satisfactorily incorporate provisions pertinent to each category of operation.

Information covered in ground training, and procedures addressed in flight training should be available to crews in an appropriate form for reference use.

b) Procedures. Prior to approval of Category I or II operations, provisions of Section 6 of this AC for procedures, duties, instructions, or any other necessary information to be used by flightcrews should be implemented by the operator.

Crewmember duties during the approach, flare, rollout, or missed approach should described. Duties should at least address responsibilities, tasks of the pilot flying the aircraft and the pilot not flying the aircraft during all stages of the approach, landing, rollout and missed approach. The duties of additional crewmembers, if required, should also be explicitly defined.

Specification of crewmember duties should address any needed interaction with dispatch or maintenance (e.g., addressing resolution of aircraft discrepancies and return to Category II/III service).

(HPa), millibars (MB), or inches (in)). Emphasis should be placed on assuring use of proper settings for easily confused values for altimeter settings, particularly when abbreviated settings are used in ATS radiotelephony, ATIS messages, or checklists (e.g. "altimeter 993" being mistakenly confused for 29.93 inches instead of 0993 HPa when the appropriate units are metric).

The operator should address any appropriate flight crew and dispatch procedures (if applicable) for unusually Low pressures if necessary for safe operations (e.g., unusable altitudes or flight levels of instrument procedures).

The operator should address appropriate flight crew and dispatch procedures (if applicable) for use of transition Level and transition altitude.

If applicable, the operator should address appropriate flight crew and dispatch procedures or limitations, as necessary, for use of VNAV in states using QFE for approach.

9. CONTINUING AIRWORTHINESS / MAINTENANCE.

9.1 Maintenance Program General Provisions. Unless otherwise approved by FAA, each operator should have an approved continuous airworthiness maintenance program (CAMP). The approved continuous airworthiness maintenance program should typically include any necessary provisions to address lower landing minima (LLM) or low visibility takeoff in accordance with the operator's intended operation and the manufacturers recommended maintenance program, MRB requirements or equivalent requirements, or any subsequent FAA designated requirements (e.g., ADs, mandatory service bulletins). Emphasis should be on maintaining and ensuring total system performance, accuracy, availability, reliability, and integrity for the intended operations.

9.2 Maintenance Program Requirements. The maintenance program should be compatible with an operator's organization and ability to implement and supervise the program. Maintenance personnel should be familiar with the operators approved program, their individual responsibilities in accomplishing that program, and availability of any resources within or outside of the maintenance organization that may be necessary to assure program effectiveness (e.g., getting applicable information related to the manufacturer's recommended maintenance program, getting information referenced in this AC such as service bulletin information).

Provision for low visibility operations may be addressed as a specific program or may be integrated with the general maintenance program.

Regardless whether the maintenance program is integrated or is designated as a specific program for Lower Landing Minima (LLM), the maintenance program should at least address the following:

1) Maintenance procedures necessary to ensure continued airworthiness relative to low visibility operations.

2) A procedure to revise and update the maintenance program.

3) A method to identify, record or designate personnel currently assigned responsibility in managing the program, performing the program, maintaining the program, or performing quality assurance for the program. This includes identification of any contractor or sub-contractor organizations, or where applicable, their personnel.

4) Verification should be made of the lower landing minima systems and configuration status for each aircraft brought into the maintenance or lower minimum program. Unless otherwise accepted by FAA, each aircraft should meet relevant criteria specified by the applicable aircraft manufacturer or avionics manufacturer for associated systems and equipment (e.g., Valid U.S. TC, appropriate STC records and compliance, assessment of status of any engineering orders, ADs, service bulletins or other compliance).

5) Identification of modifications, additions, and changes which were made to qualify aircraft systems for the intended operation or minima, if other than as specified in the AFM, TC or STC.

6) Identification of additional maintenance requirements and log entries necessary to change minima status.

7) Any discrepancy reporting procedures that may be unique to the low visibility program. If applicable, such procedures should be compatibly described in maintenance documents and operations documents.

8) Procedures that identify, monitor and report lower minimum system and component discrepancies for the purpose of quality control and analysis.

9) Procedures that define, monitor and report chronic and repetitive discrepancies.

10) Procedures that ensure aircraft remain out of lower minimum status until successful corrective action has been verified for chronic and repetitive discrepancies.

11) Procedures that ensure the aircraft system status is placarded properly and clearly documented in the aircraft log book, in coordination with maintenance control, engineering, flight operations, and dispatch, or equivalent.

12) Procedures to ensure the downgrade of an aircraft low visibility capability status, if applicable, when maintenance has been performed by persons other than those trained, qualified, or authorized to use or approve procedures related to low visibility operations.

13) Procedures for periodic maintenance of systems ground check, and systems flight check, as applicable. For example, following a heavy maintenance, suitable checks may need to be performed prior to return to service.

14) Provisions for an aircraft to remain in a specific low visibility capability status (e.g., Category II, Fail-Operational, Fail Passive) or other designated operational status used by the operator.

15) Provision should be made for periodic operational sampling of suitable performance. Typically, at least one satisfactory approach should have been accomplished within a specified period approved for that operator, unless a satisfactory systems ground check has been accomplished. A recording procedure for both satisfactory and unsatisfactory results should be included. Fleet sampling is not typically acceptable in lieu of specific aircraft assessment. Typically at least one satisfactory low visibility system operational use, or a satisfactory systems ground check, should be accomplished within 6 months, for an aircraft to remain in Category II status.

9.3 Initial And Recurrent Maintenance Training. Operator and contract maintenance personnel including mechanics, maintenance controllers, avionics technicians, personnel performing maintenance inspection or quality assurance, or other engineering personnel if applicable, should receive initial and recurrent training as necessary for an effective program. The training curriculum should include specific aircraft systems and operator policies and procedures applicable to low visibility operations. Recurrent training should typically be accomplished at least annually, or when a person has not been involved in the maintenance of the specified aircraft or systems for an extended period (e.g., greater than 6 months). Training may lead to a certification or qualification (e.g., for lower landing minima "LLM") if the operator so designates such qualification in that operator's approved program.

The training should at least include, as applicable:

1) An initial and recurrent training program for appropriate operator and contract personnel. Personnel considered to be included are maintenance personnel, quality and reliability groups, maintenance control, and incoming inspection and stores, or equivalent organizations. Training should include both classroom and at least some "hands-on" aircraft training for those personnel who are assigned aircraft maintenance duties. Otherwise, training may be performed in a classroom, by computer based training, in simulators, in an airplane or in any other effective combination of the above consistent with the approved program, and considered acceptable to FAA.

2) Subject areas for training should include: Operational concepts, aircraft types and systems affected, aircraft variants and differences where applicable, procedures to be used, manual or technical reference availability and use, processes, tools or test equipment to be used, quality control, methods for testing and return to service, signoffs required, proper Minimum Equipment List (MEL) application, general information about where to get technical assistance as necessary, necessary coordination with other parts of the operator's organization (e.g., flight operations, dispatch), and any other maintenance program requirements unique to the operator or the aircraft types or variants flown (e.g., human factors considerations, problem reporting).

3) Procedures for the use of outside vendors or vendor's parts that ensures compatibility to program requirements and for establishing measures to control and account for parts overall quality assurance.

4) Procedures to ensure tracking and control of components that are "swapped" between systems for trouble shooting when systems discrepancies can not be duplicated. These procedures should provide for total system testing and/or removal of aircraft from lower minimum status.

5) Procedures to assess, track and control the accomplishment of changes to components or systems pertinent to low visibility operations (e.g., ADs, service bulletins, engineering orders, 14 CFR requirements).

6) Procedures to record and report lower minimum operation(s) that are discontinued/ interrupted because of system(s) malfunction.

7) Procedures to install, evaluate, control, and test system and component software changes, updates, or periodic updates.

8) Procedures related to the minimum equipment list (MEL) remarks section use, which identify low visibility related systems and components, specifying limitations, upgrading and downgrading.

9) Procedures for identifying low visibility related components and systems as "required inspection items" (RII), to provide quality assurance whether performed in-house or by contract vendors.

9.4 Test Equipment/Calibration Standards. Test equipment may require periodic re-evaluation to ensure it has the required accuracy and reliability to return systems and components to service following maintenance. A listing of primary and secondary standards used to maintain test equipment that relate to low visibility operations should be maintained. It is the operator's responsibility to ensure these standards are adhered to by contract maintenance organizations. Traceability to a national standard or the manufacturer's calibration standards should be maintained.

9.5. Return To Service Procedures. Procedures should be included to upgrade or downgrade systems status concerning low visibility operations capability. The method for controlling operational status of the aircraft should ensure that flightcrews, maintenance and inspection departments, dispatch, and other administrative personnel as necessary are appropriately aware of aircraft and system status.

The appropriate level of testing should be specified for each component or system. The manufacturer's recommended maintenance program or maintenance instructions should be considered when determining the role built-in-test-equipment (BITE) should play for return to service (RTS) procedures, or for use as a method for low visibility status upgrade or downgrade.

Contract facilities or personnel should follow the operator's FAA approved maintenance program to approve an aircraft for return to service. The operator is responsible for ensuring that contract organizations and personnel are appropriately trained, qualified, and authorized.

9.6 Periodic Aircraft System Evaluations. The operator should provide a method to continuously assess or periodically evaluate aircraft system performance to ensure satisfactory operation for those systems applicable to Category II. An acceptable method for assuring satisfactory performance of a low visibility flight guidance system (e.g., autoland or HUD)

is to periodically use the system and note satisfactory performance. A reliable record such as a logbook entry or computer ACARS record showing satisfactory performance within the previous 6 months for Category II is typically an acceptable method for assuring satisfactory system operation.

Periodic flight guidance system/autoland system checks should be conducted in accordance with procedures recommended by the airframe or avionics manufacturer, or by an alternate procedure approved by the FAA. For periodic assessment, a record should be established to show when and where the flight guidance/autoland system was satisfactorily used, and if performance was not satisfactory, to describe any remedial action taken.

Use of the flight guidance/automatic landing system should be encouraged to assist in maintaining its availability and reliability.

9.7 Reliability Reporting And Quality Control.

9.7.1 Reliability Reporting -Category I. No special "Reliability Reporting or Quality Control" requirements are applicable to Category I.

9.7.2 Reliability Reporting -Category II. For a period of 1 year after an applicant has been authorized for Category II, a monthly summary should be submitted to the certificate holding office. The following information should be reported:

a. The total number of approaches tracked, the number of satisfactory approaches tracked, by aircraft/system type, and visibility (RVR), if known or recorded.

b. The total number of unsatisfactory approaches, and reasons for unsatisfactory performance, if known, listed by appropriate category(e.g., poor system performance, aircraft equipment problem/failure; ground facility problem, ATS handling, lack of critical area protection, or other).

c. The total number of unscheduled removals of components of the related avionics systems.

d. Reporting after the initial period should be in accordance with the operators established reliability and reporting requirements.

9.8 Configuration Control/System Modifications. The operator should ensure that any modification to systems and components approved for low visibility operations are not adversely affected when incorporating software changes, service bulletins, hardware additions or modifications. Any changes to system components should be consistent with the aircraft manufacturer's, avionics manufacturer's, industry or FAA accepted criteria or processes.

9.9 Records. The operator should keep suitable records (e.g., both the operator's own records and access to records of any applicable contract maintenance organization). This is to ensure that both the operator and FAA can determine the appropriate airworthiness configuration and status of each aircraft intended for Category II operation.

Contract maintenance organizations should have appropriate records and instructions for coordination of records with the operator.

9.10 FAR 129 Foreign Operator Maintenance Programs.

9.10.1 Maintenance of FAR 129 Foreign Registered Aircraft. For part 129 operators of Foreign registered aircraft (e.g., 129.14 is not applicable), the cognizant CAA is the CAA of the operator. For those situations, FAA may implicitly accept that the maintenance program is considered to be acceptable if the cognizant CAA has approved it, and if the operator or CAA indicates that the program meets US criteria, US equivalent criteria (e.g., criteria such as JAA criteria), or ICAO criteria (e.g., Annex 6 and Doc 9365/AN910 "Manual of All Weather Operations"), and the cognizant CAA has authorized Category II US operations. FAA then issues the pertinent part 129 Category II OpSpec based on the other CAAs approval for that operator. However, FAA reserves the prerogative to assure competence of both the operator and authorizing and supervising CAA, depending on whether the CAA or operator are considered to be from a category 1, 2,

or 3 country (safety classification not a low visibility landing classification), and if there have been any reported problems with the operator or CAA. Evidence of the operator satisfying or being consistent with the manufacturer's recommended maintenance program should serve as evidence of an acceptable maintenance program, regardless of the capability of the CAA or the operator, unless FAA has specifically addressed maintenance requirements beyond those of the manufacturer for that aircraft type (e.g., required service bulletin compliance or Airworthiness Directive compliance related to the flight guidance system).

9.10.2 Maintenance of FAR 129 Foreign Operated U.S. "N" Registered Aircraft. Foreign operators of U.S. "N" Registered Aircraft (e.g., those operators to which section 129.14 is applicable) should have maintenance programs equivalent to that required for a U.S. part 121 operator. Use of the part 91 provisions for General Aviation are not applicable or appropriate. POI Approval of Category II OpSpecs for a part 129.14 operator may implicitly be considered to also accept the maintenance program adequacy. Accordingly, coordination between the applicable POI and PMI is necessary before part 129 OpSpec authorization is completed. FAA is ultimately the cognizant CAA for the maintenance program in this instance, if the aircraft is N registered. FAA may however, accept the oversight of the operators CAA if that CAA is judged by FAA to have equivalent processes, criteria and procedures for oversight of maintenance programs (e.g., JAA countries). The basis for any such maintenance program should be the recommended airframe manufacturer (or avionics vendor) program, considering any adjusted MRB requirements.

10. APPROVAL OF UNITED STATES OPERATORS. Approval for Category I and II is through issuance of, or amendments to, OpSpecs. The authorizations, limitations, and provisions applicable to Category I and II operations are specified in Part C of the OpSpecs. Sample OpSpecs are provided in Appendix 7.

Operations specifications authorizing reciprocating and turbopropeller-powered airplane Category I operations that use ICAO standard NAVAIDs and ASRs and PARs are normally approved by the certificate holding district office without further review and concurrence, following satisfactory completion of the pertinent items below. Category I turbojet, turbofan and propfan normally require regional flight standards review and concurrence before approval. All Category II operations and operations using NAVAIDs which are not ICAO-standard NAVAIDs (e.g., Loran C, ARA, OSAP and TLS) normally require both regional flight standards and AFS-400 review and concurrence before approval.

10.1. Operations Manuals and Procedures. Appropriate Flightcrew Operating Manuals, Aircraft Flight Manuals, Policy Manuals, Aircraft Checklists, Quick Reference Checklists, Maintenance Manuals, Training Manuals or other equivalent operator documents (as necessary), must satisfactorily incorporate pertinent Category I and II provisions prior to Category I and II approval.

a) Manuals. Prior to approval, appropriate flightcrew operating manuals, flight manuals, airline policy manuals, maintenance manuals, training manuals, and related aircraft checklists, quick reference handbooks, or other equivalent operator information, must satisfactorily incorporate provisions pertinent to each category of operation.

Information covered in ground training, and procedures addressed in flight training should be available to crews in an appropriate form for reference use.

b) Procedures. Prior to approval of Category I or II operations, provisions of Section 6 of this AC for procedures, duties, instructions, or any other necessary information to be used by flightcrews should be implemented by the operator.

Crewmember duties during the approach, flare, rollout, or missed approach should described. Duties should at least address responsibilities, tasks of the pilot flying the aircraft and the pilot not flying the aircraft during all stages of the approach, landing, rollout and missed approach. The duties of additional crewmembers, if required, should also be explicitly defined.

Specification of crewmember duties should address any needed interaction with dispatch or maintenance (e.g., addressing resolution of aircraft discrepancies and return to Category II/III service).

The applicant's qualification program should incorporate specific procedural responsibilities, appropriate to each category of landing minima being implemented, for the pilot in command and second in command in each of the ground training subject areas listed in paragraph 7.1, and each of the flight training subject areas listed in paragraph 7.2.

10.2. Training Programs and Crew Qualification. Training programs, AQP programs (if applicable), crew qualification and checking provisions and standards, differences qualification (AC 120-53) if applicable, check airmen qualification, line check, route check, and IOE programs should each satisfactorily incorporate necessary Category I and II provisions, as applicable (see sections 7.1 through 7.9). An acceptable method to track pertinent crewmember Category I and II qualification must be established.

For manually flown Category I and II systems (HUD FDs, etc.,) assure that provisions are made for each flight crewmember to receive the appropriate training, qualification, and line experience before that particular crewmember is authorized to use the pertinent Category I and II minima.

10.3. Dispatch Planning (e.g., MEL, Alternate Airports, ETOPS). Appropriate provisions for MELs and CDLs should be made as necessary to address Category I and II operations. Dispatch procedures to ensure appropriate weather, field condition, facility status, NOTAM information, engine-out MAP performance, crew qualification, aircraft system status, and fuel planning pertinent to Category I and II should be implemented. For ETOPS operations, a satisfactory method to address item 8.10 above should be demonstrated.

10.4. Formulation of Operations Specification Requirements (e.g., RVR limits, DA (H) or MDA (H), equipment requirements, field lengths). Proposed OpSpecs should list pertinent approved airports/runways, RVR limits, required transmissometers, DA (H) use provisions, "Inner Marker based DH" provisions (if applicable), aircraft equipment provisions for "normal" and, if applicable, "engine-out" operations, landing field length provisions, and any other special requirements identified by the CHDO or AFS-400 (ETOPS Category II, etc.). The operator's manuals, procedures, checklists, QRHs, MELs, dispatch procedures etc. must be shown to be consistent with the proposed OpSpecs.

10.5 Operational/Airworthiness Demonstrations. Appropriate "aircraft system suitability" and "operational use suitability" demonstrations must be completed as described in 10.5.1 and 10.5.2, unless otherwise specified by AFS-400. The purpose of these operational demonstrations is to determine or validate the use and effectiveness of the applicable aircraft flight guidance systems, training, flightcrew procedures, maintenance program, and manuals applicable to the program being approved. Operators of aircraft having FAA approved AFMs referencing this AC as the criteria used as the basis for Category I or II airworthiness demonstration already are considered to meet provisions of 10.5.1, and typically need only address provisions of 10.5.2. for verification of operational use suitability.

10.5.1. Aircraft System Suitability Demonstration. FAA regulations addressing low visibility takeoff and landing requirements and Category I and II are primarily operating rules addressed by parts 61, 91, 97, 121, 125, and 135. These provisions apply continuously, as defined at the time of a particular operation. Airworthiness rules (part 23, 25, etc.) primarily apply at the time a "certification basis" is established for TC or STC and do not necessarily reflect "present" requirements, except through issuance of AD's. Accordingly, operationally acceptable demonstrations addressing suitability of aircraft systems for Category I and II, as applicable, must be successfully completed initially, and acceptable system status must be maintained by an operator to reflect compliance with current operating rules, to initially operate or continue to operate to Category I and II minima.

To minimize the need for repeating initial aircraft system operational suitability demonstrations for each operator, aircraft system suitability is usually demonstrated in conjunction with airworthiness approval (TC or STC) of aircraft system components such as flight guidance systems, autoland, flight directors, HUDs, flight instrument and alerting systems, radio altimeters, inertial systems, and air data systems. This approach to determination of aircraft system suitability is taken to optimize use of analysis and flight demonstration resources for operators, aircraft manufacturers, avionics manufacturers, and FAA. Accordingly, aircraft system suitability is normally demonstrated through an initial airworthiness demonstration meeting applicable provisions of Appendices to this AC (or combined airworthiness/operational evaluation for new systems or concepts, or where otherwise necessary).

Demonstration to an acceptable earlier version of AC 120-29 or equivalent criteria may continue to be used for demonstration of aircraft/aircraft systems initially type certificated prior to issuance of this revision. However, previously demonstrated aircraft or aircraft systems seeking Category I and II credits specified only in provisions of revised AC 120-29A (e.g., HUD, EVS, GNSS) must meet criteria specified in this AC.

Acceptable results of such airworthiness evaluations are usually described in Section 3 (Normal and Non-Normal Procedures) of the FAA approved AFM or AFM Supplement. For ILS precision approaches, basic type certification of an aircraft for "IFR" is considered to satisfactorily demonstrate Category I. For other systems or sensors, (HUD, GNSS etc.), other demonstrations per the Appendices of AC 120-29A may be requested for Category I. CHDOs should assure that aircraft proposed for Category I and II have completed such an appropriate aircraft system operational suitability demonstration, and that result should normally be reflected in the approved AFM or AFM Supplement, unless otherwise specified by AFS-400.

For aircraft certified by FAA through section 21.29, certain Non-United States manufactured aircraft, AFM provisions applicable to Category I should be verified by AFM review. Provisions for Category II may vary. In certain instances, AFM provisions may not be consistent with United States policy or rules applicable to Category I or II. In such instances, CHDO prior coordination with AFS-400 is appropriate to provide appropriate guidance to operators regarding applicability of various AFM provisions (e.g., DH and RVR limitations, acceptable NAVAID use, alerting system use, required versus recommended crew procedures). As a general guideline, AFMs meeting standards recognized by the FAA (JAA, UK - CAA, France - DGAC, Canada - DOT etc.) may be accepted without further demonstration.

In the event of special circumstances such as FAA Category I or II acceptance of an aircraft certificated by a Non-U.S. airworthiness authority which has only foreign AFM IFR approval, or acceptance of additional credit for existing systems, operational assessments in accordance with criteria in this AC, or equivalent criteria, may be necessary. In such instances, AFS-400 specifies applicable criteria.

10.5.2. "Operator Use Suitability" Demonstration. At least one hundred (100) successful landings should be accomplished in line operations using the Category I, II or Category III system installed in each aircraft type. Demonstrations may be conducted in line operations, during training flights, or during aircraft type or route proving runs.

If an excessive number of failures (e.g., unsatisfactory landings, system disconnects) occur during the landing demonstration program, a determination should be made for the need for additional demonstration landings, or for consideration of other remedial action (e.g., procedures adjustment, wind constraints, system modifications).

The system should demonstrate reliability and performance in line operations consistent with the operational concepts specified in section 4. In unique situations where the completion of 100 successful landings could take an unreasonably long period of time due to factors such as a small number of aircraft in the fleet, limited opportunity to use runways having appropriate procedures, and equivalent reliability assurance can be achieved, a reduction in the required number of landings may be considered on a case-by-case basis. Reduction of the number of landings to be demonstrated requires a justification for the reduction, and prior approval from the Technical Programs Division (AFS-400).

Landing demonstrations should be accomplished on U.S. facilities or international facilities acceptable to FAA. However, at the operator's option, demonstrations may be made on other runways and facilities if sufficient information is collected to determine the cause of any unsatisfactory performance (e.g., critical area was not protected). No more than 50 percent of the demonstrations may be made on such facilities.

If an operator has different models of the same type of aircraft utilizing the same basic flight control and display systems, or different basic flight control and display systems on the same type of aircraft, the operator should show that the various models have satisfactory performance, but the operator need not conduct a full operational demonstration for each model or variant.

10.5.2.1. Data Collection For Airborne System Demonstrations. Each applicant should develop a data collection method (e.g., form to be used by flightcrew) to record approach and landing performance. The resulting data and a summary of the

demonstration data should be made available to the CHDO for evaluation. The data should, as a minimum, include the following information:

(1) Inability to initiate an approach or identify deficiencies related to airborne equipment.

(2) Abandoned approaches. Give the reasons and altitude above the runway at which approach was discontinued or the automatic landing system was disengaged.

(3) This data should also include any system abnormalities which required manual intervention by the pilot to ensure a safe touchdown or touchdown and rollout, as appropriate.

10.5.2.2. Data Analysis. Unsatisfactory approaches using facilities approved for Category II or Category III where landing system signal protection was provided should be fully documented. The following factors should be considered:

(1) ATS Factors. ATS factors that result in unsuccessful approaches should be reported. Examples include situations in which a flight is vectored too close to the final approach fix/point for adequate localizer and glide slope capture, lack of protection of ILS critical areas, or ATS requests the flight to discontinue the approach.

(2) Faulty NAVAID Signals. NAVAID (e.g., ILS localizer) irregularities, such as those caused by other aircraft taxiing, over-flying the NAVAID (antenna), or where a pattern of such faulty performance can be established should be reported.

(3) Other Factors. Any other specific factors affecting the success of Category III operations that are clearly discernible to the flightcrew should be reported. An evaluation of reports discussed in subparagraphs 10.5.2.1(1), (2), and (3) will be made to determine system suitability for further Category III operations.

10.6. Eligible Airports and Runways. For Category I, Airports and Runways are eligible as specified in part 97 SIAPs, ICAO accepted international procedures at foreign airports, or special procedures in OpSpecs. For Category II, an assessment of eligible airports, runways, and aircraft systems must be made in order to list appropriate runways on OpSpecs. For Category II, runways authorized for particular aircraft in accordance with existing operations listed on the AFS-400 Category II status checklist may be directly incorporated in OpSpecs, or incorporated by reference if published part 97 SIAPS are available. Aircraft type/runway combinations not shown should be verified by aircraft system use in line operations at Category I or better minima, prior to authorization for Category II. Airports/aircraft types restricted due to special conditions (e.g., irregular underlying terrain) must be evaluated in accordance with Appendix 8, prior to OpSpec authorization.

If applicable, the operator should identify any necessary provisions for periodic demonstration of the aircraft system on runways other than those having Category II or III procedures (e.g., periodic autoland performance verification, using runways served only by a Category I procedure).

A status checklist for facilities which have special Category I and II provisions and published Category II or III procedures can be viewed on the Internet using the following address to access the FAAs Flight Standards Service home page:

FAA Category II/Category III Status Checklist - http://www.faa.gov/avr/afshome.htm.

To access this list, search the menu for Air Transportation and select All Weather Operations. The desired section can then be selected from the All Weather Operations home page menu.

10.7. Irregular Pre-Threshold Terrain and Other Restricted Runways. Airports/runways with irregular pre-threshold terrain, or runways restricted due to NAVAID or facility characteristics (see FAA Category II/Category III Status Checklist in Section 10.6) may require special evaluation, or limitations. CHDOs of operators desiring operations on these runways should contact AFS-400 to identify pertinent criteria and evaluation requirements. Various procedures used by FAA to assess irregular pre-threshold terrain are described in Appendix 8.

10.8. Engine-Out Operations and ETOPS Category II Alternates. Engine-out Category II operations may be approved in accordance with the provisions of paragraph 5.16. POIs should ensure that approved AFM includes provisions indicating that an engine-out Category II capability has been demonstrated, and the following conditions are met:

Operations should be in accordance with the applicable FAA AFM (e.g., within demonstrated wind limits, crew procedures such as "re-trim" requirements are incorporated).

Demonstrated/acceptable configurations must be used (e.g., AFDS modes, flap settings, electrical power sources, and MEL provisions).

Weight/Altitude/Temperature (WAT) limits should be established that conservatively assure obstacle clearance, or engine-out missed approach obstacle clearance should be assessed from at least the lowest applicable DA (H), considering aircraft performance and the intended missed approach flight path. Engine-out missed approach obstacle clearance should also be assessed from the end of the touchdown zone. This is to address the potential for a balked or rejected landing or go around (e.g., engine failure during a go-around that may have been due to an air traffic clearance, blocked runway, or loss of visual reference).

Appropriate training program provisions for engine inoperative approaches must be addressed (see paragraph 7.2.6).

Crews must be aware that they are expected to take the safest course of action, in their judgment, in the event that unforeseen circumstances, or unusual conditions occur that are not addressed by the "engine-out" Category II demonstrated configuration (uncertain aircraft damage, possible fire, weather deterioration, etc.). "Engine-out Category II authorization" for a twin engine turbine aircraft should not be interpreted as requiring a crew to land at the "nearest suitable" airport in time based on using engine out Category II capability (section 121.565).

OpSpecs must identify the type of "engine-out" Category II operations authorized (e.g., Dispatch for engine-out Category I and II as a takeoff, en route, or destination alternate; initiation of an "engine-out" Category II approach with a failure prior to a FAF; or continuation of an approach with an "engine-out" occurrence after passing a FAF - see Appendix 7).

Four cases are useful in considering engine inoperative Category II capability, and engine inoperative approach authorization:

1. When "dispatch planning" or preflight planning is based on aircraft configuration, system reliability, and capability of the aircraft, operator, and crew for "Engine inoperative Category II" a FAA authorization for "Engine inoperative Category II" should specifically be addressed in OpSpecs.

2. When an engine fails en route, but prior to final approach, either OpSpec authorization for Engine-inoperative Category II, or use of the Captain's "emergency authority," as the safest course of action, may be used as a basis for conduct of a Category II engine-inoperative approach.

3. When an engine fails during an approach, after passing the final approach fix, but prior to reaching DA (H), continuation of an approach in expected conditions below Category I minima may only be based on use of OpSpec authorization for "Engine-inoperative Category II", or use of the Captain's "emergency authority", as the safest course of action.

4. When an engine fails during approach, after passing the applicable DA (H), continuation of an approach and landing is at the discretion of the pilot, if the pilot determines that continuation of that approach is a safe course of action.

Section 5.17 provides airworthiness criteria for demonstration of Category II engine out capability. Sections 10.8.1 through 10.8.5 below address criteria for use of aircraft with "engine inoperative Category II" capability.

10.8.1. General Criteria for Engine-Inoperative Category II Authorization. Aircraft capability for "engine-inoperative Category II" should be approved in accordance with the provisions of paragraph 5.17, or Appendix 3.

Regardless of whether an operator is or is not operationally authorized for "engine inoperative Category II," it must be clear that having this aircraft capability should not be interpreted as requiring a Category II landing at the "nearest suitable" airport in time (e.g., Does not require landing at the nearest suitable Category II airport - section 121.565).

POIs should ensure that the following conditions are met:

1. Operations must be in accordance with the "engine inoperative Category II" AFM provisions (e.g., within demonstrated wind limits, using appropriate crew procedures).

2. Demonstrated/acceptable configurations must be used (e.g., AFDS modes, flap settings, electrical power sources, MEL provisions).

3. WAT limits must be established, and Engine-inoperative Missed Approach obstacle clearance from the TDZ must be assured.

4. Appropriate training program provisions for engine inoperative approaches must be provided (see paragraph 7.2.6).

5. Crews must be aware that they are expected to take the safest course of action, in their judgment, in the event that unforeseen circumstances, or unusual conditions occur that are not addressed by the "engine-inoperative" Category II demonstrated configuration (e.g., uncertain aircraft damage, possible fire, weather deterioration).

6. Operations Specifications must identify the type of "engine-inoperative" Category II operations authorized. Types of operations are described in sections 10.8.2 through 10.8.5 below.

10.8.2. Engine Inoperative "Dispatch Planning." Dispatch may consider "engine inoperative Category II" capability in planning flights for a takeoff alternate, en route (ETOPS) alternate, re-dispatch alternate, destination, or destination alternate only if each of the following conditions are met:

1. Dispatch has determined that the aircraft is capable of engine inoperative Category II.

2. Appropriate procedures, performance, and obstacle clearance information must be provided to the crew to be able to safely accomplish an engine inoperative missed approach at any point in the approach.

3. Appropriate operational weather constraints must be considered and specified as necessary regarding cross wind, head wind, tail wind limits considering the demonstrated capability specified in the AFM.

4. Weather reports or forecast must indicate that specified alternate minimums or landing minimums will be available for the runway equipped with approved Category II systems and procedures. The operators use of engine inoperative capability credit should consider both the availability and reliability of meteorological reports and forecasts, the time factors involved in potential forecast accuracy, the potential for variability in the weather at each pertinent airport, and the ability for the crew to receive timely weather reports and updates of forecasts en route. Dispatch considerations must account for any expected ATS delays that might be experienced during arrival due to weather, snow removal, or other factors.

5. Notices to airmen or equivalent information for airport and facility status should be reviewed to assure that they do not preclude the accomplishment of a safe engine inoperative approach on the designated runway using approved Category II procedures (e.g., temporary obstructions). Any change in NOTAM status of facilities related to use of landing minima or alternate minima must be provided to the crew in a timely manner while en route.

6. If the engine inoperative configuration is different than a normal landing configuration, a means to determine the landing distance of the section 121.195b distance must be available for the pertinent engine inoperative aircraft configuration (e.g., landing flap setting). This distance is to assure sufficient runway to provide for any limitations on the use of reverse thrust or other factors that could pertain to an inoperative engine landing (e.g., reduced flap

settings used for an engine inoperative approach). This data may be based on basic aircraft data otherwise available and need not be re-demonstrated for "engine-out' cases.

7. The expectation for runway surface condition based on pilot and dispatch interpretation of available weather reports, field conditions, and forecasts is that the applicable runway is likely to be free from standing water, snow, slush, ice, or other contaminants at the time of landing. The flightcrew must be advised of any adverse change in this expectation while en route.

8. Other requirements applicable to "all engine" Category II, such as training, crew qualification, procedures, and other items must also be addressed for the engine inoperative landing case.

9. The operator is approved for operations based on engine inoperative Category II capability. In addition, operator responsibilities for engine inoperative credit should be equivalent to that of current normal operations when an en route landing system failure causes degraded landing capability. If an inflight failure causes further degradation of engine inoperative landing capability, the flightcrew, or flightcrew in conjunction with airline operations control (e.g., Dispatch) should determine an acceptable alternative course of action (e.g., specification of different en route diversion options, revised fuel reserves plan, or revised flight plan routing).

10. When engine inoperative Category II provisions are applied to identification of any destination or destination alternate more than one qualifying destination alternate is required. This is to provide for the possibility of adverse area wide weather phenomena, or unexpected loss of landing capability at the first designated alternate airport.

11. An appropriate ceiling and visibility increment is added to the lowest authorized minimums when credit for an alternate airport or airports is sought (e.g., 200 feet DH additive and appropriate RVR additive; see Appendix 7 - Standard Operations Specifications).

It should be noted that even if the aircraft, flightcrews, and operator are authorized for engine inoperative Category II, flightcrews are not required to use a Category II approach to satisfy requirements of section 121.565. Not withstanding section 121.565, crews may elect to take a safe course of action by landing at a more distant airport than one at which a Category II approach may be required. Conversely, crews may elect to conduct the Category II approach as the safest, or a safe course of action.

10.8.3. Engine Inoperative En route. For engine failure en route, a pilot may initiate an "engine inoperative" Category II approach under the following conditions:

1. The airplane flight manual normal or non-normal sections specify that engine inoperative approach capability has been demonstrated and procedures are available.

2. The operator or pilot has taken into account the landing runway length needed for the inoperative engine configuration and corresponding approach speeds, and obstacle clearance can be maintained in the event of a missed approach.

3. The pilot determines that the approach can be conducted within the wind, weather, configuration, or other relevant constraints demonstrated for the configuration.

4. The pilot has determined from interpretation of the best available information that the runway is expected to be free from standing water, snow, slush, ice, or other contaminants.

5. The pilot is confident that the aircraft has not experienced damage related to the engine failure that would make an engine inoperative Category II approach unsuccessful, or unsafe.

6. The operator is approved and the pilot is qualified to conduct a Category II engine inoperative approach.

7. The pilot considers that conducting a Category II approach is a safe and appropriate course of action.

10.8.4. Engine Failure During Approach, Prior to Reaching Decision Altitude (Height). If the aircraft, operator, and crew meet paragraphs 5.17 for the aircraft and 10.8.2 or 10.8.3 for operational use, a Category II approach may be continued if an engine failure is experienced after passing the final approach fix or point.

In the event that an aircraft has not been demonstrated for engine inoperative Category II approach capability, or the operator or crew have not been authorized for Category II engine inoperative approaches, then continuation of an approach in the event of an engine failure is permitted only in accordance with the emergency authority of the pilot to select the safest course of action.

NOTE: For some aircraft configurations, it may be necessary to discontinue the approach after passing the final approach fix or final approach point; re-trim the aircraft for an inoperative engine, and then re-initiate the approach in order to be able to appropriately complete a satisfactory Category II landing.

10.8.5. Engine Failure After Passing Decision Altitude (Height). If an engine fails after passing the DA (H), the procedure specified in the airplane flight manual for normal or non-normal operations should be followed. All Category II approvals must consider the case of engine failure at or after DA (H). Standard OpSpecs are considered to address this case. "Engine inoperative Category II capability" is not specifically a factor in determining response to this situation.

10.9. New Category II Operators. New operators should follow demonstration period provisions of 10.5.2. Additionally, typical acceptable minima step down provisions approvable by FAA are as follows:

Starting from "limited Category I" (e.g., 300 feet DA (H) and one mile visibility) to lowest Category I minima (e.g., 200 feet DA (H) and RVR 1800):
First 250 feet DA (H) and RVR3000, and then DA (H) 200 feet and RVR1800

Starting from Category I to Category II:
First DH 100/RVR1600, then DH 100 and RVR1200

Starting from Category I for Category III:
See AC120-28D.

Each runway/procedure not already being used by any operator of a similar type aircraft should be successfully demonstrated by a line service or an evaluation approach using the Category II system and procedures, in Category I or better conditions, for each applicable aircraft/system type (e.g., B767, L1011). In addition, the operator must address special airports/runways as noted in the FAA Category II/Category III Status Checklist.

10.10. Credit for Experienced Category II or Category III Operators for New Category II Authorizations. Experienced operators are considered to be those operators having successfully completed their initial 6 month/ 100 Category II or III approach or landing demonstration period, and have current OpSpecs authorizing use of lowest applicable or intended Category II minima.

Sections 10.10.1 through 10.10.3 below address examples of program changes where "experienced operator" credit may apply.

Operators authorized for Category II using one class of system (e.g., autopilot) but who are introducing a significantly different class of system as the basis for a Category II authorization (e.g., manually flown Category II approaches using a HUD) are typically considered to be "New operators" for the purposes of demonstration period provisions and acceptable minima "step down" provisions for that class of system (see section 10.9).

10.10.1. New Airports/Runways. For ILS, Category I or II operations may be conducted at facilities with a published part 97 SIAP, or equivalent, without additional demonstration. For other systems, new airports/runways may be added to an experienced Category II operators OpSpecs without further demonstration, if the same or equivalent aircraft/aircraft system for the approach are shown on the Category II status checklist (HUD, GNSS etc.). Otherwise, the operator needs to

accomplish a line service landing at Category I or better to assure satisfactory performance. Special runways on the Category II checklist (Irregular terrain runways, etc. may still require special evaluation. See 10.7).

10.10.2. New Aircraft Systems. Unless otherwise specified by AFS-400, experienced Category II operators may initially use new or upgraded aircraft system capabilities/components to the lowest authorized minima established for those systems or components, or use reduced length demonstration periods, consistent with the new aircraft systems to be used, FAA FSB requirements, and NAVAIDs, runways, and procedures to used (e.g., New Category II HUD installations on B737-300s previously authorized for Category II for that operator based on autoland)

10.10.3. Adding a New Category II Aircraft Type. Experienced Category II operators may operate new or upgraded aircraft types/systems, or derivative types, using reduced length demonstration periods (e.g., less than 6 months/ 100 landings) when authorized by AFS-400. Demonstration requirements are established considering any applicable FAA FSB criteria, applicability of previous operator service experience, experience with that aircraft type by other operators, experience of crews of that operator for Category II and the type of system, and other such factors, on an individual basis. Appropriate minima reduction steps may also be established for an abbreviated demonstration period, consistent with prior operator experience, NAVAIDs and runways used, and procedures to be used, etc. (e.g., Newly acquired B757s being added to Category II OpSpecs, in addition to an operator's currently approved Category II A300 and MD-80 fleets).

10.11. Category II Program Status Following Operator Acquisitions/Mergers. Category II operators involved in acquisitions of other operators, or mergers, and their respective CHDOs, must assure compatibility of programs, procedures, aircraft systems, runways served and any other relevant issues before amending OpSpecs, or advising the surviving or controlling operator of the status of Category II OpSpecs of the acquired or merged operator. If CHDO doubt exists regarding applicability or status of Category II OpSpec provisions for a resulting new, surviving, acquired, or merged carrier, AFS-400 should be consulted.

10.12. Initiating Combined Category I and II, or Category I, II, and III Programs for New Equipment Types. When appropriate provisions of this AC, as amended, are used for Category I and II programs for a new equipment type (e.g., HUD) those programs may be initiated simultaneously for either a new Category II or Category II/III operator, or for an existing operator currently approved for Category II or III using other systems (e.g., ILS/FD).

10.13. United States Carrier Category I and II Operations at Foreign Airports. An applicant having U.S. Category I approval may be authorized to use that minima at foreign airports in accordance with its OpSpecs and Order 8260.31.

Once approved, the operator must comply with both FAA and local requirements. The operator must also ensure current status information for NOTAMs are available and advise its CHDO of incompatible requirements (use of OCA (H) etc.) for resolution by CHDO or AFS-400.

Although it is recognized that the systems at foreign airports may not be exactly in accordance with U.S. standards, it is important that any foreign facilities used for Category II provide the necessary information or functions consistent with the intent of the U.S. standards. Carriers desiring Category II approvals at foreign airports or runways not on the FAA-approved list should submit such requests through its FAA principal operations inspector to the Technical Programs Division, AFS-400, FAA Headquarters, Washington, D.C.

Figure 10.13-1 provides a checklist for carriers use to facilitate approval of Category II/III operations at facilities listed in the controlling states Aeronautical Information Publication (AIP). It should be used to ensure suitability of the intended facility and to verify conformance or equivalence with U.S. standards at non-U.S. airports. Completion of this checklist must reflect achieved or completed status - not planned actions. For ICAO states that do not maintain an AIP, a copy of the NOTAM, obstruction data, and/or a reliable and regular method of correspondence with the charting services used by U.S. certificate holders must be attached.

FACILITY CHECKLIST FOR CATEGORY II/III
(FOR NON-US FACILITIES)

AIRPORT (ICAO ID): _____ COUNTRY: _____ DATE: _____

Runway: _____ Length: _____ Width: _____ G/S Angle (deg.): _____

Lowest Minima _____ (ft/m) Runway TCH _____ (ft/m)

Special Limitations (if any):

_____.

LIGHTING:
Approach _____ TDZ _____ Centerline ____ HIRL ____ Stopbars _____

Other (e.g., PAPI):

_____.

MARKINGS:
Runway_____ Taxiway_____ Other (e.g., Taxiway Position) _____

Critical Area Protection Policy (ceiling/visibility or conditions):
LOC _____ G/S _____

METEROLOGICAL DATA: METARs _____ TAFs _____
TRANSMISSOMETERS:

(Locations/Lowest RVR reported /readout step increment)

Touchdown _____ Mid _____ Rollout _____

OBSTRUCTION CLEARANCE ASSESSMENT COMPLETION DATE: _____
Verified by: certificate holder _____, "state of the aerodrome" _____, other _____
Irregular terrain a factor (Y/N): _____ Similar type aircraft currently operate (Y/N) _____

NOTAM SOURCE/CONTACT: _____
FIELD CONDITIONS SOURCE/CONTACT _____

Attached procedure has been developed in accordance with:
FAA Handbook 8260.3B (TERPS) ____ ICAO PANS-OPS Doc. 8168-OPS/611, Vol-11 ____
Other Criteria Accepted by FAA ____ (indicate criteria) _____

Facility reviewed in accordance with ICAO Manual of All Weather Operations, as revised (DOC 9365/AN910) Chapters 3, 5, and 6 DATE REVIEW COMPLETED: _____

Name: _____
Title: _____
Signature: _____
Date: _____

Attachments List:

Figure 10.13 - 1

10.14. Category I and II Operations on Off-Route Charters. Unless otherwise specified by AFS-400, experienced Category I operations using non-traditional systems (HUD, GNSS etc.) and Category II operators may receive authorization to use Category I and II minima at United States off-route charter airports and runways as follows:

The runway has a published part 97 SIAP, or equivalent, or

The runway must be on the FAA Category II status checklist, and not require special evaluation, or

The aircraft used must be the same as or equivalent to an aircraft already using the facility by other United States operators (e.g., an off route charter with a B737/GNSS) could operate to runways having Category I and II Operations by an other operators B737-300 using same or equivalent system).

The OpSpec must authorize off-route charter Category I or II procedures, and

If applicable, the CHDO must be advised of the specific airports, aircraft, crew qualifications and any special provisions to be used, prior to the intended operation.

10.15. Approval of Category I and II Minima. Applicants should submit documentation requesting approval to the FAA CHDO or FSDO responsible for that operator's certificate. The application should demonstrate compliance with the appropriate provisions of applicable sections of this AC, particularly Sections 7 through 12. Proposed OpSpecs provisions should be included with the application.

Following FAA concurrence, as described in paragraph 10 above, OpSpecs authorizing Category I or II minima may be issued (see Appendix 7 for sample OpSpecs examples).

During the period following the issuance of new or revised OpSpecs for Category II (typically 6 months), the operator must successfully complete a suitable operations demonstration and data collection program in "line service" for each type aircraft, as the final part of the approval process.

The approval process is considered to be completed following a successful demonstration period. This is to ensure appropriate performance and reliability of the operator's aircraft, procedures, maintenance, airports, and NAVAIDs. This process must be completed before operations down to lowest requested minima are authorized. Section 10.5 addresses appropriate demonstration process criteria.

When the data from the operational demonstration has been analyzed and found acceptable, an applicant may be authorized the lowest requested minima consistent with this AC and applicable standard OpSpecs. Examples of minima step down provisions acceptable to FAA are provided at paragraphs 10.9 and 10.10.

10.16. Operations Specification Amendments. The operator is responsible for maintaining current OpSpecs reflecting current approvals authorized by FAA. Once FAA has authorized a change for aircraft systems, new runways, or other authorizations, appropriate and timely amendments to affected OpSpecs should be issued. Issuance of amendments to guidance or procedures in other related material such as the Flight Operations Manual or Training Program may also be required. When updated standard OpSpecs provisions are adopted by FAA, provisions of those updated OpSpecs should normally be applied to each operator's program in a timely manner.

10.17. Use of Special Obstacle Clearance Criteria (e.g. MASPS, or non-standard RNP Criteria). This paragraph addresses use of special criteria such as "Required Navigation Performance" (RNP) criteria. Pending implementation of RNP criteria for public use Standard Instrument Approach Procedures (SIAPS), obstacle assessments using RNP criteria will be conducted on a case-by-case basis, only authorized as an element of special procedures for RNP qualified operators, using RNP qualified aircraft. Early application of RNP for special procedures is typically intended to apply to instrument procedure segments classified as a transition to a final approach segment, or to facilitate definition of suitable missed approach segments. Use of special obstacle clearance criteria or non-standard RNP criteria must be approved by AFS-400.

10.18. Proof-of-Concept Requirements for New Systems/Methods. Proof-of-Concept [PoC] as used in this AC is defined as a generic demonstration in a full operational environment of facilities, weather, crew complement, aircraft systems and any other relevant parameters necessary to show concept validity in terms of performance, system reliability, repeatability, and typical pilot response to failures as well as to demonstrate that an equivalent level of safety is provided.

Proof-of-Concept may be established by a combination of analysis, simulation and/or flight demonstrations in an operational environment. PoC is typically a combined effort of FAA airworthiness and operational organizations with the applicant, with input from any associated or interested organizations.

A typical PoC program consists of the following elements:

1. Applicant submits a request to either FAA Aircraft Certification or Flight Standards.

2. Meetings are arranged to include all disciplines involved: Aircraft certification; Flight Standards; National Resource Specialists; the applicant, and supporting personnel as necessary (e.g., Air Traffic).

3. A test plan is established which includes input from applicable FAA organizations, the applicant, and as applicable, industry user groups.

4. The test plan should include as a minimum: system definition, operations procedures, qualification, training, weather and environment definition, normal, rare-normal, and non-normal conditions to be assessed, flightcrew, test subject, and test crew requirements, test procedures, test safety constraints as applicable, assessment criteria, and analysis, simulator and test aircraft requirements.

5. PoC is conducted using agreed subject pilots, as appropriate.

6. PoC data is collected in a real-time simulator environment and validated in a realistic airplane environment.

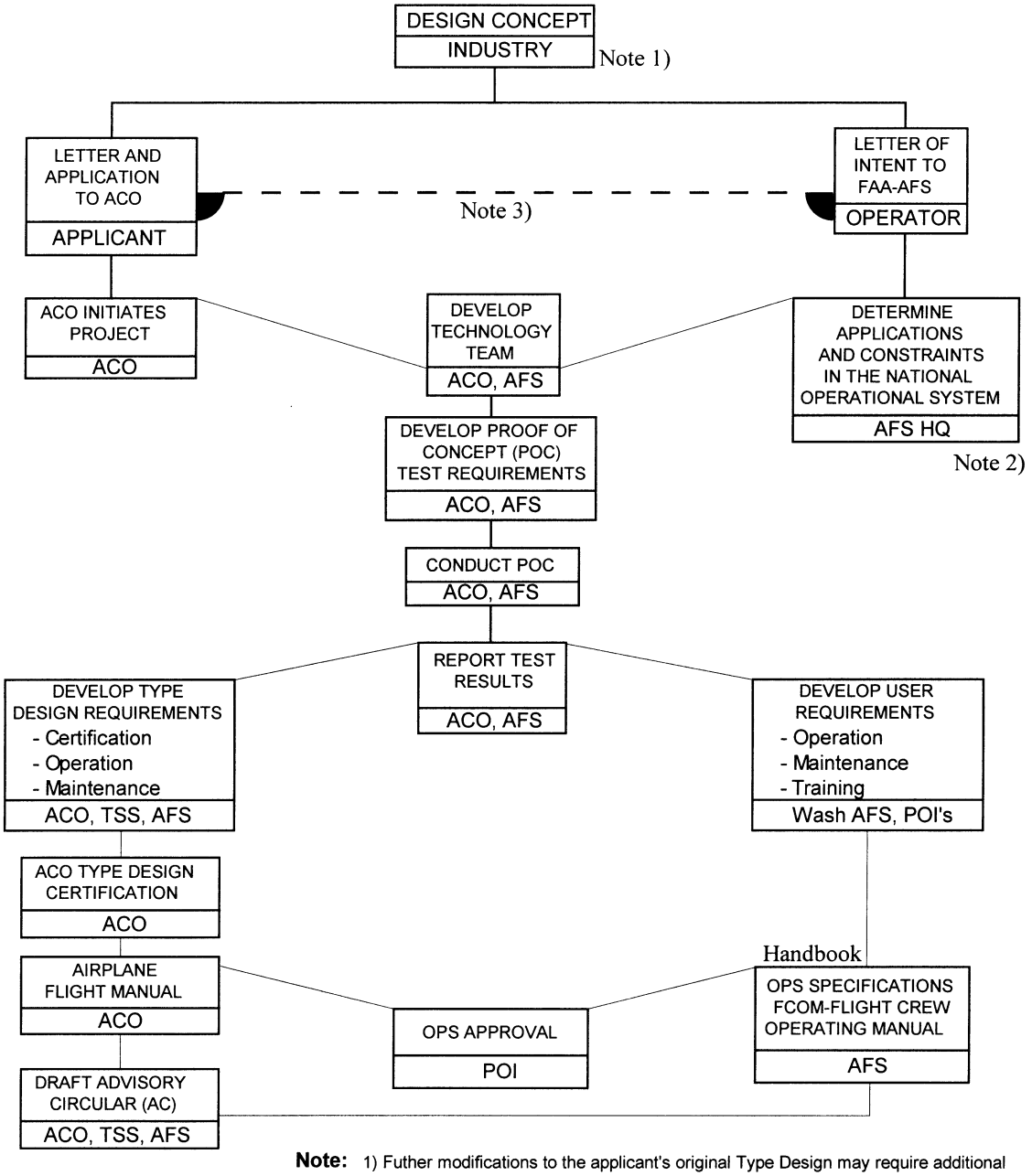
7. FAA is responsible for assessing the PoC data that is typically provided to FAA as agreed by FAA and the applicant. FAA reports relevant findings to the applicant and if applicable, interested industry representatives.

8. FAA operations and airworthiness organizations use the data to develop criteria for approval of type designs, certification processes and procedures, operating concepts, facilities, flightcrew and maintenance qualification, OpSpecs, operations procedures, manuals, AFMs, maintenance procedures, and any criteria necessary.

9. FAA AC criteria for airworthiness and operational approval typically is a product of PoC assessment.

This process is presented pictorially in the following figure:

TECHNOLOGY DEVELOPMENT PROCESS



Note: 1) Futher modifications to the applicant's original Type Design may require additional technology revisions and/or follow on Proof of Concept testing.
2) The AFS group has the responsibility to coordinate with all Industry technology groups (ALPA, APA, ATA, Industry, manufactures, vendors, DOD, NASA, etc.)
3) Both the FAA ACO and FAA AFS should be contacted to provide certification and operational data to the respective offices.

Index: ACO - Aircraft Certification Office (Including Aircraft Evaluation Group)
AFS - Washington Flight Standards Policy Office
TSS - Transport Standards Staff

RRD7/19/94

11 FOREIGN AIR CARRIER CATEGORY I WITH SYSTEMS OTHER THAN ILS OR CATEGORY II AT UNITED STATES AIRPORTS (PART 129 OPERATIONS SPECIFICATIONS).

11.1. Use of ICAO or FAA Criteria. International operators requesting or authorized for Category II at U.S. airports should meet criteria of 11.1.1 through 11.1.3 below.

11.1.1. Acceptable Criteria. Criteria Acceptable for use for assessment of international operator's applications for Category II at U.S. airports includes this AC, equivalent JAA criteria, or the ICAO Manual of All Weather Operations DOC 9365/AN910, as amended.

International operators previously approved by FAA in accordance with earlier criteria may continue to apply that earlier criteria. International operators seeking credit for operations addressed only by this revision of AC 120-29A (e.g., Category II HUD operations) must meet criteria of this AC, or equivalent criteria acceptable to FAA, for those applicable provisions.

11.1.2. Foreign Operator AFM Provisions. Unless otherwise authorized by FAA, aircraft used by international operators for Category II within the U.S. should have AFM provisions reflecting an appropriate level of Category II capability as demonstrated to or authorized by FAA, or demonstrated to or authorized by an authority recognized by FAA as having acceptable equivalent Category II airworthiness criteria (e.g., European JAA, Canada MOT, UK CAA).

11.1.3. Foreign Operator Category II Demonstrations. International (Foreign) Air Carriers meeting FAA criteria, or criteria acceptable to FAA (e.g., European JAA, ICAO Criteria including Doc 9365/AN910), and having more than six months experience in use of Category II operations with the applicable aircraft type may be approved for Category II in accordance with provisions of their own regulatory authority, or in accordance with standard provisions of part 129 OpSpecs, which ever is the more restrictive. However, operators approved in accordance with this provision may nonetheless be subject to additional FAA demonstration requirements for special situations, such as at airports with irregular underlying terrain (see 11.3), or for aircraft types not having flown to U.S. facilities having Category II procedures, etc.

For international (foreign) operators having current U.S. Category II authorization, the Category II demonstration period may be reduced or waived for addition of a new type aircraft to the existing Category II authority. The demonstration period may be reduced or waived to the extent that a successful demonstration has been accepted by FAA for that aircraft type for any other U.S. or international operator.

International (Foreign) Air Carriers not meeting above provisions may be subject to the demonstration requirements of 10.5.2 and 10.9 equivalent to those necessary for U.S. operators, as determined applicable by FAA.

11.2. Issuance of Part 129 Operations Specifications. International (Foreign) Air Carriers operating to U.S. airports that meet applicable provisions above are approved for Category II through issuance of part 129 OpSpecs (see Appendix 7).

Operators intending Category II operations at U.S. designated irregular terrain airports, or airports otherwise requiring special assessments must successfully complete those assessments prior to use of those facilities.

11.3. Use of Certain Restricted United States Facilities. Foreign Operator Category I and II operations may be conducted at facilities not having published Category I and II SIAPS, or may be conducted to minima lower than published on part 97 Category I and II SIAPS if they meet criteria equivalent to that required of a U.S. part 121 carrier, and they are approved by FAA, and the operations are acceptable to the authority of the State of the Operator. Similarly operations may be authorized at other special facilities identified on the FAA Category II/III Status checklist.

For such authorizations the following applies:

1) The Foreign operator and the pertinent authority of the State of that Operator must be advised of facility status,

2) Operator must be approved by the State of the Operator's Authority, and

3) FAA must have evidence from that authority that the operator is specifically authorized at that U.S. facility. Foreign operators typically use Category II procedures in the U.S. which are available as unrestricted public use procedures. However, FAA may also authorize certain restricted public use procedures and special Category II approach procedures for non-U.S. Operators. Typically, these procedures require special airborne equipment capability, special training, or non-standard facility and obstacle assessments. These special procedures are identified on the Category II/III status checklist and are not usually published as a part-97 Category II SIAP.

Foreign operators may be eligible to use certain of these procedures if they meet the same special criteria as would apply to a U.S. operator, and if they are approved by their own authority specifically for the use of the procedure. Some procedures may not be eligible for foreign use because of other applicable restrictions such as a restriction placed on private facility use. Special or restricted procedures require both FAA authorization and specific authorization from the state of the operator's controlling authority for each procedure. This is to assure that both the operator and foreign authority are aware of the special provisions needed, and to assure equivalent safety to use of standard ICAO criteria.

Each foreign operator seeking Category II procedure authorization at a facility not published as a standard and unrestricted Category II SIAP, or at any other facilities identified as special or restricted on the FAA Category II/III Status checklist, and that operator's controlling authority must:

1. Be aware of the restrictions applicable to the procedure (e.g., facility status),

2. Provide evidence to FAA of the controlling authority's approval of the operator for each special procedure requested, and

3. Must have the applicable limitations and conditions included in that operator's part 129 OpSpecs for each procedure to be used.

Foreign operators shall not normally be authorized special Category II operations to minima lower than those specified in part 97 Category II SIAPS consistent with ICAO criteria.

12. OPERATOR REPORTING, AND TAKING CORRECTIVE ACTIONS.

12.1. Operator Reporting. The reporting of satisfactory and unsatisfactory Category II aircraft performance is a useful tool in establishing and maintaining effective maintenance and operating policy and procedures. Additionally, when maintained over longer periods of time the report data substantiates a successful program and can identify trends, or recurring problems that may not be related to aircraft performance. Information obtained from reporting data and its analysis is useful in recommending and issuing appropriate corrective action(s).

Accordingly, for a period of at least 1 year after an applicant has been advised that its aircraft and program meet Category II requirements, and reduced minima are authorized, the operator is to provide a monthly summary to the FAA of the following information:

(1) The total number of approaches where the equipment constituting the airborne portion of the Category II system was used to make satisfactory (actual or simulated) approaches to the applicable Category II minima (by aircraft type).

(2) The total number of unsatisfactory approaches by airport and aircraft registration number with explanations in the following categories - airborne equipment faults, ground facility difficulties, aborts of approaches because of ATS instructions, or other reasons.

(3) Notify the certificate-holding office as soon as possible of any system failures or abnormalities that require flightcrew intervention after passing 100 feet during operations in weather conditions below Category I minima.

APPENDIX 1 DEFINITIONS AND ACRONYMS

This Appendix contains the definition of terms and acronyms used within this Advisory Circular (AC).

Definitions

ctual Navigation Performance	A measure of the current estimated navigation performance, excluding Flight Technical Error (FTE). Actual Navigation Performance is measured in terms of accuracy, integrity, and availability of navigation signals and equipment. Note: Also see Estimated Position Uncertainty [EPU].
eronautical Chart Critical data	Data for Aeronautical charts determined in accordance with RTCA or ICAO Annex 4 criteria considered to have a very low probability of significant error and very high probability of validity [e.g. P_{error} per unit data element $<1 \times 10^{-8}$]
eronautical Chart Essential data	Data for Aeronautical charts determined in accordance with RTCA or ICAO Annex 4 criteria considered to have a low probability of significant error and high probability of validity [e.g. P_{error} per unit data element $<1 \times 10^{-5}$]
eronautical Chart Routine data	Data for Aeronautical charts determined in accordance with RTCA or ICAO Annex 4 criteria considered to have a routine possibility of significant error and routine validity [e.g. P_{error} per unit data element $<1 \times 10^{-3}$]
pproach Intercept Waypoint APIWP)	Variable waypoint used only when intercepting the Final Approach Segment (FAS).
utomatic Dependent urveillance (ADS)	A surveillance technique in which aircraft automatically provide, via data link, data derived from on-board navigation and position fixing systems, including aircraft identification, four dimensional position and additional data as appropriate (ICAO - IS&RP Annex 6).
lert Height	A height above the runway based on the characteristics of the aircraft and its fail-operational landing system, above which a Category III approach would be discontinued and a missed approach initiated if a failure occurred in one of the redundant parts of the fail operational landing system, or in the relevant ground equipment. (ICAO - IS&RP Annex 6).
irborne Navigation system	The airborne equipment that senses and computes the aircraft position relative to the defined path, and provides information to the displays and to the flight guidance system. It may include a number of receivers and/or system computers such as a Flight Management Computer and typically provides inputs to the Flight Guidance System.
utomatic Go-Around	A Go-Around which is accomplished by an autopilot following pilot selection and initiation of the "Go-Around" autopilot mode, when an autopilot is engaged in an "approach mode".
vailability	An expectation that systems or elements required for an operations will be available to perform their intended functions so that the operation will be accomplished as planned to an acceptable level of probability.
atastrophic Failure Condition	Failure Condition which would result in multiple fatalities, usually with the loss

	of the airplane.
ategory I	A precision instrument approach and landing with a decision height not lower than 60m (200 ft) and with either a visibility not less than 800m (2400 ft), or a runway visual range not less than 550m (1800 ft). (ICAO - IS&RP Annex 6).
ategory II	A precision instrument approach and landing with a decision height lower than 60m (200 ft) but not lower than 30m (100 ft) and a runway visual range not less than 350m (1200 ft). (ICAO - IS&RP Annex 6).
ategory IIIa	A precision instrument approach and landing with a decision height lower than 30m (100 ft), or no decision height and a runway visual range not less than 200m (700 ft). (ICAO - IS&RP Annex 6).
ategory IIIb	A precision instrument approach and landing with a decision height lower than 15m (50 ft), or no decision height and a runway visual range less than 200m (700 ft) but not less than 50m (150 ft). (ICAO - IS&RP Annex 6). FAA Note - the United States does not use Decision Heights for Category IIIb.
ategory IIIc	A precision instrument approach and landing with no decision height and no runway visual range limitations. (ICAO - IS&RP Annex 6).
lass I Navigation	Navigation within the service volume of an ICAO Standard Navaid.
lass II Navigation	A flight operation or portion of a flight operation (irrespective of the means of navigation) which takes place outside (beyond) the designated Operational Service Volume of an ICAO standard airway navigation facility or Navaid (e.g. VOR, VOR/DME, NDB).
ombiner	The element of the HUD in which the pilot simultaneously views the external visual scene along with synthetic information provided in symbolic form.
ommand Information	Information that directs the pilot to follow a course of action in a specific situation (e.g., Flight Director).
onformal Information	Information which correctly overlays the image of the real world, irrespective of the pilots viewing position.
atum Crossing Height [DCH]	The height (in feet or meters) of the Flight Path Control Point above the Runway Datum Point.
ecision Altitude (DA)	A specified altitude in the precision approach at which a missed approach must be initiated if the required visual reference to continue the approach has not been established. (Adapted from ICAO - IS&RP Annex 6).
ecision Altitude (Height) A(H)	For Category I, a specified minimum altitude in an approach by which a missed approach must be initiated if the required visual reference to continue the approach has not been established. The "Altitude" value is typically measured by a barometric altimeter or equivalent (e.g., Inner Marker) and is the determining factor for minima for Category I Instrument Approach Procedures. The "Height" value specified in parenthesis is typically a radio altitude equivalent height above the touchdown zone (HAT) used only for advisory reference and does not necessarily reflect actual height above underlying terrain. For Category II and certain Category III procedures (e.g., when using a Fail-Passive autoflight system) the Decision Height (or an equivalent IM position fix) is the controlling minima, and the altitude value specified is advisory. The altitude value is available for cross reference. Use of a barometrically referenced DA for Category II is not currently authorized for 14 CFR part 121,

	129 or 135 operations at US facilities (Adapted from ICAO - IS&RP Annex 6).
ecision Height (DH)	A specified height in the precision approach at which a missed approach must be initiated if the required visual reference to continue the approach has not been established (Adapted from ICAO - IS&RP Annex 6).
esign Eye Box	The three dimensional volume in space surrounding the Design Eye Position from which the HUD information can be viewed.
esign Eye Position	The position at each pilot's station from which a seated pilot achieves the optimum combination of outside visibility and instrument scan.
efined Path	The path that is defined by the path definition function.
esired Path	The path that the flight crew and air traffic control can expect the aircraft to fly.
nhanced Vision System	An electronic means to provide the flight crew with a synthetic image of the external scene.
stimate of Position Uncertainty EPU], or stimated Position Error [EPE]	A measure based on a scale which conveys the current position estimation performance - Also called Estimated Position Error (EPE)
xtended Final Approach egment (EFAS)	That segment of an approach, co-linear with the Final Approach Segment, but which extends beyond the Glidepath Intercept Waypoint (GPIWP) or Approach Intercept Waypoint (APIWP).
xternal Visual Reference	Information the pilot derives from visual observation of real world cues outside the cockpit.
xtremely Improbable	A probability of occurrence less than or equal to 1×10^{-9} per hour of flight, or per event (e.g., takeoff, landing).
xtremely Remote	A probability of occurrence greater than 1×10^{-9} but less than or equal to 1×10^{-7} per hour of flight, or per event (e.g., takeoff, landing).
ail Operational System	A system capable of completing the specified phases of an operation following the failure of any single system component after passing a point designated by the applicable safety analysis (e.g., Alert Height).
ail Passive System	A system which, in the event of a failure, causes no significant deviation of aircraft flight path or attitude.
ield of View	As applied to a Head Up Display - the angular extent of the display that can be seen from within the design eye box.
requent	Occurring more often than 1 in 1000 events or 1000 flight hours.
inal Approach Course (FAC)	The final bearing/radial/track of an instrument approach leading to a runway, without regard to distance. For certain previously designed approach procedures that are not aligned with a runway, the FAC bearing/radial/track of an instrument approach may lead to the extended runway centerline, rather than to alignment with the runway.
inal Approach Fix (FAF)	The fix from which the final approach to an airport is executed. For standard procedures that do not involve multiple approaches segments intercepting the runway centerline near the runway, the FAF typically identifies the beginning of the straight-in final approach segment.

inal Approach Point (FAP)	The point applicable to instrument approaches other than ILS, MLS or GLS, with no depicted FAF (e.g. only applies to approaches such as an on-airport VOR or NDB), where the aircraft is established inbound on the final approach course from a procedure turn, and where descent to the next procedurally specified altitude, or to minimum altitude, may be commenced.
inal Approach Segment (FAS)	The segment of an approach extending from the Glidepath Intercept Waypoint (GPIWP) or Approach Intercept Waypoint (APIWP), whichever occurs later, to the Glidepath Intercept Reference Point (GIRP).
light Guidance System	The means available to the flight crew to maneuver the aircraft in a specific manner either manually or automatically. It may include a number of components such as the autopilot, flight directors, relevant display and annunciation elements and it typically accepts inputs from the airborne navigation system.
light Path Alignment Point FPAP)	The FPAP is a point, usually at or near the stop end of a runway, used in conjunction with the RDP and a vector normal to the WGS-84 ellipsoid at the RDP to define the geodesic plane of a final approach and landing flight path. The FPAP typically may be the RDP for the reciprocal runway
light Path Control Point FPCP)	The Flight Path Control Point (FPCP) is a calculated point located directly above the Runway Datum Point. The FPCP is used to relate the vertical descent of the final approach flight path to the landing runway.
light Technical Error (FTE)	The accuracy with which the aircraft is controlled as measured by the indicated aircraft position with respect to the indicated command or desired position. Note: FTE does not include human performance conceptual errors, typically which may be of large magnitude (e.g. entry of an incorrect waypoint or waypoint position, selection of an incorrect procedure, selection of an incorrect NAVAID frequency, failure to select a proper flight guidance mode).
lide Path Angle [GPA]	The glide path angle is an angle, defined at the FPCP, that establishes the descent gradient for the final approach flight path of an approach procedure. It is measur the geodesic plane of the approach (defined by the RDP, FPAP, and WGS-84 ellipsoid's center). The vertical and horizontal references for the GPA are a vecto normal to the WGS-84 ellipsoid at the RDP and a plane perpendicular to that vect the FPCP, respectively.
lide Path Intercept Waypoint GPIWP)	The point at which the established glide slope intercept altitude (MSL) meets the Final Approach Segment (FAS), on a standard day, using a standard altimeter setting (1013.2 HPa or 29.92 in).
lidepath Intercept Reference oint [GIRP]	The Glidepath Intercept Reference Point is the point at which the extension of the final approach path intercepts the runway.
NSS Landing System (GLS)	A differential GNSS (e.g. GPS) based landing system providing both vertical and lateral position fixing capability. Note: Term may be applied to any GNSS based differentially corrected landing system providing lateral and vertical service for approach and landing equivalent to or better than that provided by a U.S. Type I ILS, or equivalent ILS specified by ICAO Annex 10.

lobal Positioning System [GPS]	The NAVSTAR Global Positioning System operated by the United States Department of Defense. It is a satellite -based radio navigation system composed of space, control and user segments. The space segment is composed of satellites. The control segment is composed of monitor stations, ground antennas and a master control station. The user segment consists of antennas and receiver-processors that derive time and compute a position and velocity from the data transmitted from the satellites.
lobal Navigation Satellite ystem [GNSS]	A world wide position, velocity and time determination system that uses one or more satellite constellations.
uidance	Information used during manual control or monitoring of automatic control of the aircraft that is of sufficient quality to be used by itself for the intended purpose.
o-around	A transition from an approach to a stabilized climb.
azardous Failure Condition	Failure Conditions which would reduce the capability of the airplane or the ability of the crew to cope with adverse operating conditions to the extent that there would be: (i) A large reduction in safety margins or functional capabilities; (ii) Physical distress or higher workload such that the flight crew cannot be relied upon to perform their tasks accurately or completely; or (iii) Serious or fatal injury to a relatively small number of the occupants.
ead Up Display System	An aircraft system which provides head-up guidance to the pilot during flight. It includes the display element, sensors, computers and power supplies, indications and controls. It may receive inputs from an airborne navigation system or flight guidance system.
ybrid System	A combination of two, or more, systems of dissimilar design used to perform a particular operation.
mprobable	A probability of occurrence greater than 1×10^{-9} but less than or equal to 1×10^{-5} per hour of flight, or per event (e.g., takeoff, landing).
ndependent Systems	A system that is not adversely influenced by the operation, computation, or failure of some other identical, related, or separate system (e.g., two separate ILS receivers).
nfrequent	Occurring less often than 1 in 1000 events or 1000 flight hours.
nitial Missed Approach IMAWP)	Waypoint used to define the Missed Approach Point (MAP).
nitial Missed Approach egment	That segment of an approach from the Glide Path Intercept Waypoint (GPIWP) to the Initial Missed Approach Waypoint (IMAWP).
nstantaneous Field of View	The angular extent of a HUD display which can be seen from either eye from a fixed position of the head.
ntegrity	A measure of the acceptability of a system, or system element, to contribute to the required safety of an operation.

anding	For the purpose of this AC, landing will begin at 100 ft., the DH or the AH to the first contact of the wheels with the runway.
anding rollout	For the purpose of this AC, rollout starts from the first contact of the wheels with the runway and finishes when the airplane has slowed to a safe taxi speed (in the order of 30 knots).
ajor Failure Condition	Failure Condition which would reduce the capability of the airplane or the ability of the crew to cope with adverse operating conditions to the extent that there would be, for example, a significant reduction in safety margins or functional capabilities, a significant increase in crew workload or in conditions impairing crew efficiency, or discomfort to occupants, possibly including injuries.
inimum Descent ltitude(Height) MDA(H)]	See individual definitions below for MDA and MDH.
inimum Descent Altitude MDA)	A specified altitude in a non-precision approach or circling approach below which descent must not be made without the required visual reference. Minimum Descent Altitude (MDA) is referenced to mean sea level. (ICAO - IS&RP Annex 6).
inimum Descent Height MDH)	A specified height in a non-precision approach or circling approach below which descent must not be made without the required visual reference. Minimum Descent Height (MDH) is referenced to aerodrome elevation or to the threshold if that is more than 7 ft. (2m) below the aerodrome elevation. A MDH for a circling approach is referenced to the aerodrome elevation. (ICAO - IS&RP Annex 6). FAA Note - The United States does not use Minimum Descent Heights.
inimum Use Height (MUH)	A height specified during airworthiness demonstration or review above which, under standard or specified conditions, a probable failures of a system is not likely to cause a significant path displacement unacceptably reducing flight path clearance from specified reference surfaces (e.g. airport elevation) or specified obstacle clearance surfaces.
inor Failure Condition	Failure Condition which would not significantly reduce airplane safety and which involve crew actions that are well within their capabilities. Minor Failure Conditions may include, for example, a slight reduction in safety margins or functional capabilities, a slight increase in crew workload, such as routine flight plan changes, or some inconvenience to occupants.
issed Approach	The flight path followed by an aircraft after discontinuation of an approach procedure and initiation of a go-around. Typically a "missed approach" follows a published missed approach segment of an instrument approach procedure, or follows radar vectors to a missed approach point, return to landing, or diversion to an alternate.
onitored HUD	A HUD which has internal or external capability to reliably detect erroneous sensor inputs or guidance outputs, to assure that a pilot does not receive incorrect or misleading guidance, failure, or status information.
on-Normal Means of avigation	A means of navigation which does not satisfy one or more of the necessary levels of accuracy, integrity, and availability for a particular area, route, procedure or operation, and which may require use of a pilot's "emergency

	authority" to continue navigation.
OTAM	Notice to Airmen - A notice distributed by means of telecommunication containing information concerning the establishment, condition or change in any aeronautical facility, service, procedure or hazard, the timely knowledge of which is essential to personnel concerned with flight operations. (ICAO - IS&RP Annex 6).
erformance	A measure of the accuracy with which an aircraft, a system, or an element of a system operates compared against specified parameters. Performance demonstration(s) typically include the component of Flight Technical Error (FTE).
rimary Means of Navigation	A means of navigation which satisfies the necessary levels of accuracy and integrity for a particular area, route, procedure or operation. The failure of a "Primary Means" of navigation may result in, or require reversion to a "non-normal" means of navigation, or an alternate level of RNP. NOTE: Qualification as a "primary means" of navigation typically requires that ANP/EPU be less than RNP for 99.99% of the time.
edundant	The presence of more than one independent means for accomplishing a given function or flight operation. Each means need not necessarily be identical.
emote	A probability of occurrence greater than 1×10^{-7} but less than or equal to 1×10^{-5} per hour of flight, or per event (e.g., takeoff, landing).
equired Navigation Performance RNP)	A statement of the navigation performance necessary for operation within a defined airspace (Adapted from ICAO - IS&RP Annex 6). NOTE: Required Navigation Performance is specified in terms of accuracy, integrity, and availability of navigation signals and equipment for a particular airspace, route, procedure or operation.
equired Navigation erformance Containment (RNP ontainment)	RNP Containment represents a bound of the rare-normal performance and specified non-normal performance of a system, typically expressed as 2*RNP (X). When RNP represents Gaussian statistical performance at a level of two sigma (2 x standard deviation), then containment represents a nominal performance bound specified at the level of four sigma (4 x standard deviation). Note: RNP containment use may vary with intended operational applications.
equired Navigation erformance Level or Type RNP Level or RNP Type)	A value typically expressed as a distance in nautical miles from the intended position within which an aircraft would be for at least 95 percent of the total flying time (Adapted from ICAO - IS&RP Annex 6). NOTE: Applications of RNP to terminal area and other operations may also include a vertical and/or longitudinal component. ICAO may use the term RNP Type, while certain other States, aircraft manuals, procedures, and operators may use the term RNP Level. Example - RNP 4 represents a navigation lateral accuracy of plus or minus 4 nm (7.4 km) on a 95% basis. RNP is typically defined in terms of its lateral accuracy, and has an associated lateral containment boundary.

equired Visual Reference	That section of the visual aids or of the approach area which should have been in view for sufficient time for the pilots to have made an assessment of the aircraft's position and rate of change of position, in relation to the desired flight path. In Category III operations with a decision height, the required visual reference is that specified for the particular procedure and operations (ICAO - IS&RP Annex 6 - Decision Height definition - Note 2).
unway Datum Point (RDP)	The RDP is used in conjunction with the FPAP and a vector normal to the WGS-84 ellipsoid at the RDP to define the geodesic plane of a final approach flight path to the runway for touchdown and rollout. It is a point at the designated lateral center of the landing runway defined by latitude, longitude, and ellipsoidal height. The RDP is typically a surveyed reference point used to connect the approach flight path with the runway. The RDP may or may not necessarily be coincident with the designated runway threshold
unway Segment (RWS)	That segment of an approach from the glidepath intercept reference point (GIRP) to Flight Path Alignment Point (FPAP).
ituation Information	Information that directly informs the pilot about the status of the aircraft system operation or specific flight parameters including flight path.
tandard Landing Aid (SLA)	In the context of this section of this AC, is a navigation service provided by a State which meets internationally accepted performance standards (e.g., ICAO Standards and Recommended Practices (SARPs) or equivalent State standards).
upplementary Means of avigation	A means of navigation which satisfies one or more of the necessary levels of accuracy, integrity, or availability for a particular area, route, procedure or operation. The failure of a "Supplementary Means" of navigation may result in, or require reversion to another alternate "normal" means of navigation for the intended route, procedure or operation. NOTE: Qualification as a "supplementary means" of navigation typically requires that ANP/EPU be less than RNP for 99% of the time.
ynthetic Reference	Information provided to the crew by instrumentation or electronic displays. May be either command or situation information.
ynthetic Vision System	A system used to create a synthetic image representing the environment external to the airplane.
ake off Guidance System	A system which provides directional command guidance to the pilot during a takeoff, or takeoff and aborted takeoff. It includes sensors, computers and power supplies, indications and controls.
otal Field of View	The maximum angular extent of the display that can be seen with either eye, allowing head motion within the design eye box.
ouch Down Zone (TDZ)	The first 3000 ft. of usable runway for landing, unless otherwise specified by the FAA, or other applicable ICAO or State authority (e.g for STOL aircraft, or

	in accordance with an SFAR).
isual Guidance	Visual information the pilot derives from the observation of real world cues, outside the cockpit and uses as the primary reference for aircraft control or flight path assessment.

Acronyms

ACRONYM	EXPANSION
ABAS	Aircraft Based Augmentation System
ACI	Adjacent Channel Interface
ADS	Automatic Dependent Surveillance
AFCS	Autopilot Flight Control System
AFDS	Autopilot Flight Director System
AFGS	Automatic Flight Guidance System
AFM	Airplane Flight Manual
AH	Alert Height
AHI	All-Weather Harmonization Items
ALS	Approach Light System
ANP	Actual Navigation Performance
APIWP	Approach Intercept Waypoint
APM	Aircrew Program Manager
AQP	Advanced Qualification Program
ARA	Airborne Radar Approach
ASR	Airport Surveillance Radar
ATC	Air Traffic Control
ATS	Air Traffic Service
AWO	All Weather Operations
CAA	Civil Aviation Authority
CDL	Configuration Deviation List
CHDO	Certificate Holding District Office
CL	Centerline Lights
CNS	Communication, Navigation and Surveillance
CRM	Collision Risk Model
CRM	Cockpit Resource Management
DA	Decision Altitude
DA(H)	Decision Altitude(Height)
DCH	Datum Crossing Height
DDM	Difference of Depth Modulation
DEP	Design Eye Position

DGNSS	Differential Global Navigation Satellite System
DH	Decision Height
DME	Distance Measuring Equipment
ECEF	Earth Centered Earth Fixed
EFAS	Extended Final Approach Segment
EGPWS	Enhanced Ground Proximity Warning System
EPE	Estimated Position Error
EPU	Estimated Position Uncertainty
ETOPS	Extended Range Operations with Two-Engine Airplanes
EVS	Enhanced Vision System
FAF	Final Approach Fix
FAP	Final Approach Point
FAS	Final Approach Segment
FBS	Fixed Base Simulator
FHA	Functional Hazard Assessment
FMC	Flight Management Computer
FMS	Flight Management System
FPAP	Flight Path Alignment Point
FPA	Flight Path Angle
FPCP	Flight Path Control Point
FSB	Flight Standardization Board
FTE	Flight Technical Error
GBAS	Ground Based Augmentation System
GCA	Ground Controlled Approach
GIRP	Glidepath Intercept Reference Point
GLS	GNSS Landing System
GNSS	Global Navigation Satellite System
GPA	Glide Path Angle
GPIWP	Glide Path Intercept Waypoint
GPWS	Ground Proximity Warning System
GPS	Global Positioning System
HAT	Height above Touchdown
HUD	Head Up Display
IAW	In Accordance With

ICAO	International Civil Aviation Organization
IM	Inner Marker
IMAS	Initial Missed Approach Segment
IMAWP	Initial Missed Approach Waypoint
ILS	Instrument Landing System
INAS	International Airspace System
IRS	Inertial Reference System
IRU	Inertial Reference Unit
JAR AWO	Joint Aviation Regulations – All Weather Operations
LAAS	Local Area Augmentation System
LAD	Local Area Differential
LLM	Lower Landing Minima
MAP	Mode Annunciator Panel
MAP	Missed Approach Point
MASPS	Minimum Aviation System Performance Standards
MCP	Mode Control Panel
MDA	Minimum Descent Altitude
MDA(H)	Minimum Descent Altitude(Height)
MDH	Minimum Descent Height - NOTE: MDH is not used for US Operations
MEL	Minimum Equipment List
METAR	ICAO Routine Aviation Weather Report
MLS	Microwave Landing System
MMEL	Master Minimum Equipment List
MMR	Multi-mode Receiver
MRB	Maintenance Review Board
MUH	Minimum Use Height
NAS	National Airspace System
NAVAID	Navigational Aid
NDB	Non-directional Beacon
NOTAM	Notice to Airman
NRS	National Resource Specialist
OIS	Obstacle Identification Surface
OSAP	Offshore Standard Approach Procedure
PAR	Precision Approach Radar

PF	Pilot Flying
PIC	Pilot in Command
PIREP	Pilot Weather Report
PNF	Pilot Not Flying
POC	Proof of Concept
POI	Principal Operations Inspector
QFE	Altimeter Setting referenced to airport field elevation
QNE	Altimeter Setting referenced to standard pressure (1013.2HPa or 29.92")
QNH	Altimeter Setting referenced to airport ambient local pressure
QRH	Quick Reference Handbook
RAIL	Runway Alignment Indicator Light System
RCLM	Runway Center Line Markings
RDMI	Radio Direction Magnetic Indicator
RDP	Runway Datum Point
REIL	Runway End Identification Lights
RII	Required Inspection Item
RMI	Radio Magnetic Indicator
RNP	Required Navigation Performance
RNPx2	RNP Containment Limit (2 times RNP value)
RTCA	Radio Technical Commission for Aeronautics
RTS	Return to Service
RVR	Runway Visual Range
RWS	Runway Segment
SARPS	ICAO Standards and Recommended Practices
SBAS	Space Based Augmentation System
SFL	Sequence Flasher Lights
SIAP	Standard Instrument Approach Procedure
SLA	Standard Landing Aid
SMGCP	Surface Movement and Guidance Plan
SMGCS	Surface Movement Guidance Control System
STC	Supplemental Type Certificate
SV	Space Vehicle
TAF	Terminal Aviation Forecast
TC	Type Certificate

TDZ	Touchdown Zone
TLS	Target Level of Safety
ua	micro amps
VASI	Visual Approach Slope Indicator
VOR	VHF Omni-directional Radio Range
VORTAC	Co-located VOR and TACAN
V_1	Takeoff Decision Speed
V_{ef}	Engine Failure Speed
$V_{failure}$	Speed at which a failure occurs
V_{lof}	Liftoff Speed
V_{mcg}	Ground Minimum Control Speed
WAAS	Wide area augmentation system
WAD	Wide Area Differential
WAT	Weight, Altitude and Temperature

APPENDIX 7
STANDARD OPERATIONS SPECIFICATIONS

1. GENERAL. This appendix provides samples of standard operations specifications (OpSpecs) provisions typically issued for operations described in this AC. Standard OpSpecs are developed by FAA Flight Standards Service, Washington D.C., and are issued by certificate holding district offices (CHDOs) to each specific operator. CHDO's incorporate any necessary specific information applicable to that operator, to that operator's fleet of aircraft, or to that operator's specific operational environment or requirements (e.g. areas of operation).

OpSpecs specify limitations, conditions, and other provisions which operators must comply with to comply with the FAR. Standard OpSpecs are normally coordinated with industry prior to issuance to ensure a mutual and clear understanding of content and applicability, and to pre-determine the effect they may have on operations. After appropriate coordination new standard provisions, or amendments to existing provisions are incorporated into the FAA's computer based OpSpecs program used by field offices.

Use of standard OpSpecs provisions facilitates application of equivalent safety criteria for various operators, aircraft types and operating environments. Occasionally, it may be necessary to issue OpSpecs provisions that are non-standard because of unique situations not otherwise addressed by standard provisions. Non-standard OpSpec provisions may be more or less restrictive than standard provisions, depending on the circumstances necessary to show appropriate safety for the intended application. Nonstandard OpSpecs provisions typically should not be contrary to the provisions of standard paragraphs. In cases when a non-standard paragraph is more or less restrictive than a standard paragraph, appropriate justification must be provided.

The following Standard OpSpec paragraphs are provided:

Part A - General

A002 Definitions and Abbreviations

Part C - Airplane Terminal instrument Procedures and Airport Authorizations and Limitations

C051 Terminal Instrument Procedures
C052 Basic Instrument Approach Procedure Authorizations -- All Airports
C053 Category I IFR Landing Minimums -- All Airports
C054 Special Limitations and Provisions for Instrument Approach Procedures and IFR Landing Minimums
C055 Alternate Airport IFR Weather Minimums
C056 IFR Standard Takeoff Minimums, Part 121 Airplane Operations -- All Airports
C059 Category II Instrument Approach and Landing Operations
C061 Flight Control Guidance Systems for Automatic Landing Operations Other Than Category II or III
C062 Manually Flown Flight Control Guidance Systems Certified for Landing Operations Other Than Category II or III
C064 Special Terminal Area IFR Operations -- Authorizations, Limitations and Provisions
C074, Category I, ILS, MLS, or GLS Approach Procedures and IFR Landing Minimums - All Airports.
C075, Circling Approach Procedures
C076, Category I IFR Landing Minimums -- Contact Approaches
C078, Lower Than Standard Takeoff Minimums, Part 121 Airplane Operations -- All Airports

FAR 121 Operations Specifications - PART A

A002. Definitions and Abbreviations

HQ Control: 03/27/97
HQ Revision: 010

Unless otherwise defined in these operations specifications, all words, phrases, definitions, and abbreviations have identical meanings to those used in the Federal Aviation Act of 1958, as amended. Additionally, the definitions listed below are applicable to operations conducted in accordance with these operations specifications.

(1) Instrument Approach Categories are defined as follows:

Category I	An instrument approach and landing with a decision altitude(height) or minimum descent altitude(height) not lower than 60m (200 ft) and with either a visibility not less than 800m (2400 ft), or a runway visual range not less than 550m (1800 ft).
Category II	A precision instrument approach and landing with a decision height lower than 60m (200 ft) but not lower than 30m (100 ft) and a runway visual range not less than 350m (1200 ft).
Category IIIa	A precision instrument approach and landing with a decision height lower than 30m (100 ft), or no decision height and a runway visual range not less than 200m (700 ft).
Category IIIb	A precision instrument approach and landing with a decision height lower than 15m (50 ft), or no decision height and a runway visual range less than 200m (700 ft) but not less than 50m (150 ft).
Category IIIc	A precision instrument approach and landing with no decision height and no runway visual range limitations.

(2) Other related definitions are as follows:

Certificate Holder. In these operations specifications the term "certificate holder" shall mean the holder of the certificate described in Part A paragraph A001 and any of its officers, employees, or agents used in the conduct of operations under these operations specifications.

Class I Navigation. Class I navigation is any en route flight operation or portion of an operation that is conducted entirely within the designated Operational Service Volumes (or ICAO equivalent) of ICAO standard airway navigation facilities (VOR, VOR/DME, NDB). Class I navigation also includes en route flight operations over routes designated with an "MEA GAP" (or ICAO equivalent). En route flight operations conducted within these areas are defined as "Class I navigation" operations irrespective of the navigation means used. Class I navigation includes operations within these areas using pilotage or any other means of navigation which does not rely on the use of VOR, VOR/DME, or NDB.

Class II Navigation. Class II navigation is any en route flight operation which is not defined as Class I navigation. Class II navigation is any en route flight operation or portion of an en route operation irrespective of the means of navigation) which takes place outside (beyond) the designated Operational Service Volume (or ICAO equivalents) of ICAO standard airway navigation facilities (VOR, VOR/DME, NDB). However, Class II navigation does not include en route flight operations over routes designated with an "MEA GAP" (or ICAO equivalent).

Operational Service Volume. The Operational Service Volume is that volume of airspace surrounding a NAVAID which is available for operational use and within which a signal of usable strength exists and where that signal is not operationally limited by co-channel interference. Operational Service Volume includes all of the following:

(1) The officially designated Standard Service Volume excluding any portion of the Standard Service Volume which has been restricted.

(2) The Expanded Service Volume.

(3) Within the United States, any published instrument flight procedure (victor or jet airway, SID, STARS, SIAPS, or instrument departure).

(4) Outside the United States, any designated signal coverage or published instrument flight procedure equivalent to U.S. standards.

Reliable Fix. A "reliable fix" means station passage of a VOR, VORTAC, or NDB. A reliable fix also includes a VOR/DME fix, an NDB/DME fix, a VOR intersection, an NDB intersection, and a VOR/NDB intersection provided course guidance is available from one of the facilities and the fix lies within the designated operational service volumes of both facilities which define the fix.

Runway. In these operations specifications the term "runway" in the case of land airports, water airports and heliports, and helipads shall mean that portion of the surface intended for the takeoff and landing of land airplanes, seaplanes, or rotorcraft, as appropriate.

Navigation Facilities. Navigation facilities are those ICAO Standard Navigation Aids (VOR, VOR/DME, and/or NDB) which are used to establish the en route airway structure within the sovereign airspace of ICAO member states. These facilities are also used to establish the degree of navigation accuracy required for air traffic separation service and Class I navigation within that airspace.

Planned Re-dispatch or Re-release En Route. The term "planned re-dispatch or re-release en route" means any flag operation (or any supplemental operation that includes a departure or arrival point outside the 48 contiguous United States and the District of Columbia) that is planned before takeoff to be re-dispatched or re-released inflight in accordance with section 121.631(c) to a destination airport other than the destination airport specified in the original dispatch or release.

Part A
Sample Operations Specifications Paragraph C051, **C051, Terminal Instrument Procedures.**

a. The certificate holder is authorized to conduct terminal instrument operations using the procedures and minimums specified in these operations specifications, provided one of the following conditions is met:

(1) The terminal instrument procedure used is prescribed by these operations specifications.

(2) The terminal instrument procedure used is prescribed by Title 14 Code of Federal Regulations (CFR) Part 97, Standard Instrument Approach Procedures.

(3) At U.S. military airports, the terminal instrument procedure used is prescribed by the U.S. military agency operating the airport.

b. If Applicable, Special Limitations, and Provisions for Instrument Approaches at Foreign Airports.

(1) If authorized foreign airports, the terminal instrument procedure used is prescribed or approved by the government of an ICAO contracting State. The terminal instrument procedure must meet criteria equivalent to that specified in either the United States Standard for Terminal Instrument Procedures (TERPS) or ICAO Document 8168-OPS, Procedures for Air Navigation Services-Aircraft Operations (PANS-OPS), Volume II, or Joint Aviation Authorities (JAR-OPS1).

(2) Terminal instrument procedures may be developed and used by the certificate holder for any foreign airport, provided the certificate holder makes a determination that each procedure developed is equivalent to U.S. TERPS, ICAO PANS-OPS, or JAR-OPS1 criteria and submits to the FAA a copy of the terminal instrument procedure with supporting documentation.

(3) At foreign airports, the certificate holder shall not conduct terminal instrument procedures determined by the FAA to be "not authorized for United States air carrier use." In these cases, the certificate holder may develop and use a terminal instrument procedure provided the certificate holder makes a determination that each procedure developed is equivalent to U.S. TERPS, ICAO PANS-OPS, or JAR-OPS1 criteria and submits to the FAA a copy of the terminal instrument procedure with supporting documentation.

(4) When operating at foreign airports where the metric system is used and the minimums are specified only in meters, the certificate holder shall use the metric operational equivalents in the following table for both takeoff and landing operations.

RVR	
FEET	**METERS**
300 ft	75 m
400 ft	125 m
500 ft	150 m
600 ft	175 m
700 ft	200 m
1000 ft	300 m
1200 ft	350 m
1600 ft	500 m
1800 ft	550 m
2000 ft	600 m
2100 ft	650 m
2400 ft	750 m
3000 ft	1000 m
4000 ft	1200 m
4500 ft	1400 m
5000 ft	1500 m
6000 ft	1800 m

METEOROLOGICAL VISIBILITY		
STATUTE MILES	**METERS**	**NAUTICAL MILES**
1/4 sm	400 m	1/4 nm
3/8 sm	600m	3/8 nm
1/2 sm	800 m	1/2 nm
5/8 sm	1000 m	5/8 nm
3/4 sm	1200 m	7/10 nm
7/8 sm	1400 m	7/8 nm
1 sm	1600 m	9/10 nm
1 1/8 sm	1800 m	1 1/8 nm
1 1/4 sm	2000 m	1 1/10 nm
1 1/2 sm	2400 m	1 3/10 nm
1 3/4 sm	2800 m	1 1/2 nm
2 sm	3200 m	1 3/4 nm
2 1/4 sm	3600 m	2 nm
2 1/2 sm	4000 m	2 1/2 nm
2 3/4 sm	4400 m	2 4/10 nm
3 sm	4800 m	2 6/10 nm

(5) When operating at foreign airports where the landing minimums are specified only in RVR and meteorological visibility is provided, the certificate holder shall convert meteorological visibility to RVR by multiplying the reported visibility by the appropriate factor, shown in the following table. ***(RVR = (reported meteorological visibility) X (factor))***

AVAILABLE LIGHTING	DAY	NIGHT
High Intensity approach and runway lighting	1.5	2.0
Any type of lighting installation other than above	1.0	1.5
No lighting	1.0	N/A

NOTE: The conversion of reported Meteorological Visibility to RVR shall not be used for takeoff minima, Category II or III minima, or when a reported RVR is available.

C052. Basic Instrument Approach Procedure Authorizations - All Airports **HQ Control: 03/26/97**

HQ Revision: 021

The certificate holder is authorized to conduct the following types of instrument approach procedures and shall not conduct any other types.

a. Instrument Approach Procedures.

VOR	VOR/DME	NDB	NDB/DME	LOC
LOC BC	LOC/DME	SDF	TACAN	ASR
LDA	LDA/DME	RNAV	GPS	AZI
AZI/DME	AZI/DME Back Course			

b. Precision Instrument Approach Procedures Other Than Categories II and III.

ILS
GLS
MLS
PAR

c. Other Conditions and Limitations.
(as required)

1. Issued by the Federal Aviation Administration.
2. These Operations Specifications are approved by direction of the Administrator.

_____
Principal Inspector

3. Date Approval is effective:

Amendment No.:

4. I hereby accept and receive the Operations Specifications in this paragraph.

(Name) (Title)Date:

Sample Operations Specifications Paragraph C053, **Category I Approach Procedures and IFR Landing Minimums - All Airports.**

The certificate holder shall not use any IFR Category I landing minimum lower than that prescribed by the applicable published instrument approach procedure. The IFR landing minimums prescribed in this paragraph are the lowest Category I minimums authorized for use at any airport.

a. Category I Approach Procedures Other Than ILS, MLS, or GLS. The certificate holder shall not use an IFR landing minimum for straight-in nonprecision approach procedures, lower than that specified in the following table. Touchdown zone (TDZ) RVR reports, when available for a particular runway, are controlling for all approaches to and landings on that runway (See NOTE 6).

Straight-In Category I Approaches (Approaches other than ILS, MLS, or GPS Landing System (GLS))					
		Aircraft Category A, B, and C		**Aircraft Category D**	
Approach Light Configuration	**HAT** (See NOTES 1, 2, & 3)	**Visibility in Statute Miles**	**TDZ RVR In Feet**	**Visibility in Statute Miles**	**TDZ RVR In Feet**
No Lights	250	1	5,000	1	5,000
ODALS, or MALS, or SALS	250	3/4	4,000	1	5,000
MALSR, or SSALR, or ALSF-1, or ALSF-2	250	1/2 (See NOTE 4)	2,400 (See NOTE 4)	1 (See NOTE 5)	5,000 (see NOTE 5)
DME ARC, any light configuration	500	1	5,000	1	5,000

NOTE 1: For NDB approaches with a FAF, add 50 ft. to the HAT.
NOTE 2: For NDB approaches without a FAF, add 100 ft. to the HAT.
NOTE 3: For VOR approaches without a FAF, add 50 ft. to the HAT.
NOTE 4: For NDB approaches, the lowest authorized visibility is 3/4 and the lowest RVR is RVR 4,000.
NOTE 5: For LOC approaches, the lowest authorized visibility is 3/4 and the lowest RVR is RVR 4,000.
NOTE 6: The mid RVR and rollout RVR reports (if available) provide advisory information to pilots. The mid RVR report may be substituted for the TDZ RVR report if the TDZ RVR report is not available.

b. Special Limitations and Provisions for Instrument Approach Procedures at Foreign Airports. If the certificate holder operates to foreign airports the following applies:

(1) Foreign approach lighting systems equivalent to U.S. standards are authorized for precision and nonprecision instrument approaches. Sequenced flashing lights are not required when determining the equivalence of a foreign approach lighting system to U.S. standards.

(2) For straight-in landing minimums at foreign airports where an MDA(H) or DA(H) is not specified, the lowest authorized MDA(H) or DA(H) shall be obtained as follows:

(a) When an obstruction clearance limit (OCL) is specified, the authorized MDA(H) or DA(H) is the sum of the OCL and the touchdown zone elevation (TDZE). If the TDZE for a particular runway is not available, threshold elevation shall be used. If threshold elevation is not available, airport elevation shall be used. For approaches other than ILS, MLS, or GLS, the MDA(H) may be rounded to the next higher 10-foot increment.

(b) When an obstacle clearance altitude (OCA)/obstacle clearance height (OCH) is specified, the authorized MDA(H) or DA(H) is equal to the OCA/OCH. For approaches other than ILS, MLS, or GLS, the authorized MDA(H) may be expressed in intervals of 10 feet.

(c) The HAT or HAA used for approaches other than ILS, MLS, or GLS, shall not be below those specified in subparagraph a above of this operations specification.

(3) When only an OCL or an OCA/OCH is specified, visibility and/or RVR minimums appropriate to the authorized HAA/HAT values determined in accordance with subparagraph b(2) above will be established in accordance with criteria prescribed by U.S. TERPS or Joint Aviation Authorities (JAR-OPS1).

(4) When conducting an instrument approach procedure outside the United States, the certificate holder shall not operate an aircraft below the prescribed MDA(H) or continue an approach below the DA(H), unless the aircraft is in a position from which a normal approach to the runway of intended landing can be made and at least one of the following visual references is clearly visible to the pilot:

(a) Runway, runway markings, or runway lights.
(b) Approach lights.
(c) Threshold, threshold markings, or threshold lights.
(d) Touchdown zone, touchdown zone markings, or touchdown zone lights.
(e) Visual glidepath indicator (such as, VASI, PAPI).
(f) Any other feature which clearly identifies the landing surface.

C054. Special Limitations and Provisions for Instrument Approach Procedures and IFR Landing Minimums **Control: 2/10/89** **Revision: 010**

a. High Minimum Pilot-in-Command Provisions. Pilots-in-command who have not met the requirements of FAR 121.652 shall use the high minimum pilot RVR landing minimum equivalents as determined from the following table.

RVR Landing Minimum as Published	RVR Landing Minimum Equivalent required for High Minimum Pilots
RVR 1800	RVR 4500
RVR 2000	RVR 4500
RVR 2400	RVR 5000
RVR 3000	RVR 5000
RVR 4000	RVR 6000
RVR 5000	RVR 6000

b. Limitations on the Use of Landing Minimums for Turbojet Airplanes.

(1) A pilot-in-command of a turbojet airplane shall not conduct an instrument approach procedure when visibility conditions are reported to be less than 3/4 statute mile or RVR 4000 until that pilot has been specifically qualified to use the lower landing minimums.

(2) A pilot-in-command of a turbojet airplane shall not begin an instrument approach procedure when the visibility conditions are reported to be less than 3/4 statute mile or RVR 4000, unless the following conditions exist:

(a) Fifteen percent additional runway length is available over the landing field length specified for the destination airport by the appropriate FAR's.

(b) Precision instrument (all weather) runway markings or runway centerline lights are operational on that runway.

(Additional Text Allowed)

U.S. Department of Transportation Federal Aviation Administration

Operations Specification

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C055. Alternate Airport IFR Weather Minimums. The certificate holder is authorized to derive alternate airport weather minimums from the following table. In no case shall the certificate holder use an alternate airport weather minimum other than any applicable minimum derived from this table. In determining alternate airport weather minimums, the certificate holder shall not use any published instrument approach procedure which specifies that alternate airport weather minimums are not authorized. Credit for alternate minima based Category II or Category III capability is predicated on authorization for engine inoperative Category III operations for the certificate holder, aircraft type and flightcrew for the respective Category II or Category III minima applicable to the alternate airport.

Alternate Airport IFR Weather Minimums

Approach Facility Configuration	Ceiling (no change from existing provisions) (no change from existing provisions)	Visibility
(additional provision added to paragraph C55)		
For airports with a published Category II or Category III approach, and at least two operational navigational facilities, each providing a straight-in precision approach procedure to different, suitable runways.	For Category III procedures, a ceiling of at least 200' HAT, or For Category II procedures, a ceiling of at least 300' HAT.	For Category III procedures, a visibility of at least 1800RVR, or For Category II procedures, a visibility of at least 4000RVR.

C056. IFR Takeoff Minimums, Part 121 Airplane Operations - All Airports **Control: 10/05/90** **Revision: 011**

Standard takeoff minimums are defined as 1 statute mile visibility or RVR 5000 for airplanes having 2 engines or less and 1/2 statute mile visibility or RVR 2400 for airplanes having more than 2 engines. RVR reports, when available for a particular runway, shall be used for all takeoff operations on that runway. All takeoff operations, based on RVR, must use RVR reports from the locations along the runway specified in this paragraph.

a. When a takeoff minimum is not published, the certificate holder may use the applicable standard takeoff minimum and any lower than standard takeoff minimums authorized by these operations specifications. When standard takeoff minimums or greater are used, the Touchdown Zone RVR report, if available, is controlling.

b. When a published takeoff minimum is greater than the applicable standard takeoff minimum and an alternate procedure (such as a minimum climb gradient compatible with aircraft capabilities) is not prescribed, the certificate holder shall not use a takeoff minimum lower than the published minimum. The Touchdown Zone RVR report, if available, is controlling.

Sample operations specification C059, **Category II Instrument Approach and Landing Operations.**

The certificate holder is authorized to conduct Category II (CAT II) instrument approach and landing operations to the airports and runways listed in subparagraph g using the procedures and minimums specified in this paragraph and shall conduct no other Category II operations.

a. Category II Approach and Landing Minimums and Authorized Aircraft. The certificate holder shall not use any Category II IFR landing minimums lower than those prescribed by any applicable published Category II instrument approach procedure. The Category II IFR landing minimums prescribed by these operations specifications are the lowest Category II minimums authorized for use at any airport. The certificate holder is authorized to use the following Category II straight-in approach and landing minimums at authorized airports and runways for the aircraft listed in the following table, provided the special limitations in subparagraph f. are met.

Airplane M/M/S	DH Not less Than	Lowest Authorized RVR

NOTE 1: Lower than standard CAT II, RVR 1000 (300m) is authorized with a decision height of 100 feet when an auto-coupled approach, or head-up display (HUD) system is used to touchdown, and;

- The airplane and its automatic flight control guidance system, or manually flown guidance system, are approved for approach and landing operations as specified by paragraph C060, C061, or C062 of these operations specifications, and;
- The autopilot and approach coupler, or HUD system, is listed in the required CAT II airborne equipment table in subparagraph c of this operations specification.

b. Required Category II Airborne Equipment. The flight instruments, radio navigation equipment, and other airborne systems required by the applicable Section of the Title 14 Code of Federal Regulations (CFR) and the FAA-approved Airplane Flight Manual for the conduct of Category II operations must be installed and operational. The additional airborne equipment listed or referenced in the following table is also required and must be operational for Category II operations.

Kind of Category II Operation			
Airplane (M/M/S)	Additional Equipment & Special Provisions	Manual	Auto Pilot

c. Required RVR Reporting Equipment. The certificate holder shall not conduct any Category II operation, unless the following RVR reporting systems are installed and operational for the runway of intended landing:

(1) For authorized landing minimums not less than RVR 1600, the touchdown zone RVR reporting system is required and must be used. This RVR report is controlling for all operations.

(2) For authorized landing minimums less than RVR 1600, the touchdown zone and the rollout RVR reporting systems are required and must be used. The touchdown zone RVR report is controlling for all operations and the rollout RVR report provides advisory information to pilots. The mid RVR report (if available) provides advisory information to pilots and may be substituted for the rollout RVR report if the rollout RVR report is not available.

d. Pilot Qualifications. A pilot-in-command shall not conduct Category II operations in any airplane until that pilot has successfully completed the certificate holder's approved Category II training program, and has been certified as

being qualified for Category II operations by one of the certificate holder's check airmen properly qualified for Category II operations or an FAA inspector. Pilots-in-command who have not met the requirements of 14 CFR Section 121.652 shall use high minimum pilot landing minima not less than RVR 1800.

e. Operating Limitations. The certificate holder shall not begin the final approach segment of an instrument approach procedure, unless the latest reported controlling RVR is at or above the minimums authorized for the operation being conducted. If the aircraft is established on the final approach segment and the controlling RVR is reported to decrease below the authorized minimums, the approach may be continued to the DH applicable to the operation being conducted. The certificate holder shall not begin the final approach segment of an instrument approach procedure when the touchdown zone RVR report is less than RVR 1800, unless all of the following conditions are met:

(1) The airborne equipment required by subparagraph c above is installed and operating satisfactorily.

(2) The required components of the Category II ground system are installed and in normal operation including all of the following:

(a) Each required component of the ground based Category II navigation system. For ILS operations, a precision or surveillance radar fix, a designated NDB, VOR, DME fix, or a published minimum GSIA fix may be used in lieu of an outer marker. Except for Category II instrument approach procedures designated as "RA NA" (radar/radio altimeter not authorized) operative radar/radio altimeters may be used in lieu of an inner marker. A middle marker is not required.
(b) ALSF-1 or ALSF-2 approach lighting systems or foreign equivalents. Sequenced flashing lights are required only at U.S. airports.
(c) High intensity runway lights.
(d) Approved touchdown zone lights and runway centerline lights.

(3) The RVR reporting systems required by subparagraph c. above are operating satisfactorily.

(4) The crosswind component on the runway of intended landing is 15 knots or less.

(5) Fifteen percent additional runway length is available over the landing field length specified for destination airport in 14 CFR Section 121.195(b) or Section 135.385(b), as appropriate.

f. Missed Approach Requirements. A missed approach shall be initiated when any of the following conditions exist:

(1) Upon reaching the authorized decision height, the pilot has not identified the required visual references to safely continue the approach by visual reference alone.

(2) After passing the authorized decision height, the pilot loses contact with the required visual references, or a reduction in visual reference occurs which prevents the pilot from safely continuing the approach by visual reference alone.

(3) The pilot determines that a landing cannot be safely accomplished within the touchdown zone.

(4) Before arriving at DH, any of the required elements of the Category II ground system becomes inoperative.

(5) Any of the airborne equipment required for the particular Category II operation being conducted becomes inoperative. However, if the certificate holder is authorized both manually flown and automatically flown Category II operations, an automatic approach may be continued manually using the approved manual systems, provided the automatic system has malfunctioned and is disengaged higher than 1,000 feet above the elevation of the touchdown zone.

(6) The crosswind component at touchdown is expected to be greater than 15 knots.

g. Authorized Category II Airports and Runways. The certificate holder is authorized Category II operations at airports and runways approved for Category II operations in 14 CFR Part 97. Category II operations are also authorized for the airports and runways listed in the following table. Precision CAT II landing minimums to airports without touchdown zone and centerline lighting are authorized only when an auto-coupled approach, or HUD system is used to touchdown. Additionally, MALSR orALSF-1 or ALSF-2 approach lighting system or equivalent are required for these operations.

Airport Ident	Runways	Special Limitations

C061 Flight Control Guidance Systems for Automatic Landing Operations Other Than Categories II and III

Control: 1/11/88

Revision: 010

The certificate holder is authorized to conduct automatic approach and landing operations (other than Categories II and III) at suitably equipped airports. The certificate holder shall conduct all automatic approach and landing operations in accordance with the provisions of this paragraph.

a. Authorized Airplanes and Flight Control Guidance Systems. The certificate holder is authorized to conduct automatic approach and landing operations using the following aircraft and automatic flight control guidance systems.

Airplane Type (make/model)	**Flight Control Guidance Systems (manufacturer/model)**

b. Special Limitations.

(1) The certificate holder shall conduct all operations authorized by this paragraph in accordance with applicable FARs and the airworthiness certification basis of the automatic flight control guidance system used.

(2) The certificate holder shall not conduct automatic landing operations to any runway using these systems, unless the certificate holder determines that the flight control guidance system being used permits safe automatically flown approaches and landings to be conducted at that runway.

(3) The certificate holder shall not conduct any operations authorized by this paragraph, unless the certificate holder's approved training program provides training in the equipment and special procedures to be used.

(4) Except when automatic approaches and landings are performed under the supervision of a properly qualified check airman, any pilot used by the certificate holder to conduct automatic approaches and landings must be qualified in accordance with the certificate holder's approved training program.

C062. Manually Flown Flight Control Guidance System Certified for Landing Operations Other Than Categories II and III — **Control: 1/11/88** **Revision: 010**

The certificate holder is authorized to conduct approach and landing operations (other than Categories II and III) at suitably equipped airports using manually flown flight control guidance systems approved for landing operations. The certificate holder shall conduct all approach and landing operations authorized by this paragraph in accordance with the provisions of this paragraph.

a. Authorized Airplanes and Manual Flight Control Systems. The certificate holder is authorized to conduct approach and landing operations using the following aircraft and manually flown flight control guidance systems which are certified for landing operations.

Airplane Type (make/model)	**Manual Flight Control Guidance Systems (manufacturer/model)**

b. Special Limitations.

(1) The certificate holder shall conduct all operations authorized by this paragraph in accordance with applicable FAR's and the airworthiness certification basis of the manually flown flight control guidance system being used.

(2) The certificate holder shall not conduct landing operations to any runway using these systems, unless the certificate holder determines that the flight control guidance system being used permits safe manually flown approaches and landings to be conducted at that runway.

(3) The certificate holder shall not conduct any operations authorized by this paragraph, unless the certificate holder's approved training program provides training in the equipment and special procedures to be used.

(4) Except when operations are performed under the supervision of a properly qualified check airman, any pilot used by the certificate holder to conduct manually flown approaches and landings using these systems must be qualified for the operation being conducted in accordance with the certificate holder's approved training program.

C064. Special Terminal Area IFR Operations - Authorizations, Limitations, and Provisions — **Control: 10/05/90** **Revision: 010**

The certificate holder is authorized to conduct the following special terminal area IFR operations specified in accordance with the limitations and provisions of this paragraph. The certificate holder shall not conduct any other special terminal area IFR operations under these operations specifications.

a. The certificate holder is authorized to conduct nonscheduled passenger and scheduled and nonscheduled all-cargo terminal area IFR operations outside controlled airspace provided that the certificate holder determines that:

(1) The airport is served by an authorized instrument approach procedure.

(2) The airport has an approved source of weather.

(3) The airport has a suitable means for the pilot-in-command to acquire air traffic advisories and the status of airport services and facilities.

(4) The facilities and services necessary to safely conduct IFR operations are available and operational at the time of the particular operation.

b. The certificate holder is authorized to designate and use an alternate or diversionary airport which will involve terminal area IFR operations outside controlled airspace provided that at the time of any operation to that alternate or diversionary airport, the certificate holder determines that the provisions specified in subparagraphs a.(1) through (4) are met.

c. The certificate holder is authorized to conduct scheduled passenger terminal area IFR operations outside controlled airspace when, at the scheduled time of operation, the airspace would have been controlled but, because of ATC, weather, or mechanical delays, the flight arrives at a time when the controlled airspace is not operational, provided the certificate holder determines that the provisions specified in subparagraphs a.(1) through (4) are met.

d. The certificate holder is authorized to conduct scheduled passenger terminal area IFR operations outside controlled airspace provided an authorized instrument approach procedure and the facilities and services list below are available and operational at the time of the particular operation.

Airport Ident	**Weather Source**	**Traffic & Airport Advisory Service**

e. The certificate holder is authorized to conduct operations using the Special Terminal Instrument Procedures specified for the following airports, provided the operation is conducted in accordance with the limitations and provisions in the Special Terminal Instrument Procedures attached to this paragraph.

Airport Ident	**Special Terminal Instrument Procedures**

Sample operations specifications C074, **Category I, ILS, MLS, or GLS Approach Procedures and IFR Landing Minimums - All Airports.**

The certificate holder shall not use any IFR Category I landing minimum lower than that prescribed by the applicable published instrument approach procedure. The IFR landing minimums prescribed in this paragraph are the lowest Category I minimums authorized for use at any airport.

a. Category I,**ILS, MLS, or GPS Landing System (GLS)** Approach Procedures. The certificate holder shall not use an IFR landing minimum for precision, ILS, MLS, or GLS approach procedures lower than specified in the following table. Touchdown zone RVR reports, when available for a particular runway, are controlling for all approaches to and landings on that runway (See NOTE 3).

PRECISION APPROACHES (Require operative lateral and vertical guidance)			
Approach Light Configuration	**HAT**	**Aircraft Category A, B, C, and D**	
		Visibility in Statute Miles	**TDZ RVR in Feet**
No Lights, or ODALS,	200	¾	4000
MALS, or SALS	200	5/8	3000
MALSR, or SSALR, or ALSF-1 or ALSF-2	200	½	2400
MALSR with TDZ and CL, or SSALR with TDZ and CL, or ALSF-1/ALSF-2 with TDZ and CL	200	visibility not authorized (See NOTE 1)	1800 (See NOTE 2)
MALS, or MALSR, or SSALR, or ALSF-1/ALSF-2, or REILS and HIRL, or RAIL, and HIRL (See NOTE 3)	200	visibility not authorized	1800

NOTE 1: Visibility values below 1/2 statute mile are not authorized and shall not be used.
NOTE 2: The mid RVR and rollout RVR reports (if available) provide advisory information to pilots. The mid RVR report may be substituted for the TDZ RVR report if the TDZ RVR report is not available.
NOTE 3: These minimums apply to autoland or HUD-equipped aircraft when operated by a properly qualified flightcrew and flown in the Category III landing mode at the authorized airports and runways listed below.

b. The certificate holder is authorized Category I landing minimums as low as 1800 RVR for its autoland or **HUD-equipped** aircraft at the following airports and runways:

Airport 4- Letter Identifier	Runways	Special Limitation

c. Special Aircrew, Aircraft Authorized Minimums. The certificate holder shall not use an IFR landing minimum for straight-in Category I approaches labeled as "Special Aircrew, Aircraft Authorization Required" except in accordance with subparagraph a of this operations specification and the following:

(1) The authorized aircraft must be equipped with an approved approach coupler, flight director, or a **h**ead-up display (HUD) system which provides guidance to decision height. Pilots-in-command (PIC) must be required to engage the autopilot coupler, flight director, or HUD as applicable and use it to decision height or initiation of missed approach unless adequate visual references with the runway environment are established which allow safe continuation to a landing.

(2) Should the autopilot, flight director, or HUD malfunction or be disengaged during the approach, the PIC must execute a missed approach not later than arrival at standard minimums unless visual reference to the runway environment has been established.

(3) Pilots must be trained in the use of the autopilot coupler, flight director, or HUD as applicable and demonstrate proficiency in ILS approaches to minimums using this equipment on checks conducted to satisfy Title 14 CFR Section 121.441 or Section 135.297.

d. Special Limitations and Provisions for Instrument Approach Procedures at Foreign Airports. If the certificate holder operates to foreign airports the following applies:

(1) Foreign approach lighting systems equivalent to U.S. standards are authorized for precision and nonprecision instrument approaches. Sequenced flashing lights are not required when determining the equivalence of a foreign approach lighting system to U.S. standards.

(2) For straight-in landing minimums at foreign airports where an MDA(H) or DA(H) is not specified, the lowest authorized MDA(H) or DA(H) shall be obtained as follows:

(a) When an obstruction clearance limit (OCL) is specified, the authorized MDA(H) or DA(H) is the sum of the OCL and the touchdown zone elevation (TDZE). If the TDZE for a particular runway is not available, threshold elevation shall be used. If threshold elevation is not available, airport elevation shall be used. For approaches other than ILS, MLS, or GLS, the MDA(H) may be rounded to the next higher 10-foot increment.

(b) When an obstacle clearance altitude (OCA)/obstacle clearance height (OCH) is specified, the authorized MDA(H) or DA(H) is equal to the OCA/OCH. For approaches other than ILS, MLS, or GLS, the authorized MDA(H) may be expressed in intervals of 10 feet.

(c) The HAT or HAA used for precision approaches shall not be below those specified in subparagraph a of this operations specification.

(3) When only an OCL or an OCA/OCH is specified, visibility and/or RVR minimums appropriate to the authorized HAA/HAT values determined in accordance with subparagraph d(2) above will be established in accordance with criteria prescribed by U.S. TERPS or Joint Aviation Authorities (JAR-OPS1).

(4) When conducting an instrument approach procedure outside the United States, the certificate holder shall not operate an aircraft below the prescribed MDA(H) or continue an approach below the DA(H), unless the aircraft is in

a position from which a normal approach to the runway of intended landing can be made and at least one of the following visual references is clearly visible to the pilot:

(a) Runway, runway markings, or runway lights.
(b) Approach lights.
(c) Threshold, threshold markings, or threshold lights.
(d) Touchdown zone, touchdown zone markings, or touchdown zone lights.
(e) Visual glide path indicator (such as, VASI, PAPI).
(f) Any other feature which clearly identifies the landing surface.

C075. Circling Approach Procedures. **HQ Control: 05/03/98**
HQ Revision: 000

The certificate holder is authorized to conduct *[training, testing, and/or checking, as applicable]* in the circling approach maneuver subject to the appropriate Practical Test Standards for airman certification under 14 CFR Part 61 in the following flight simulators programmed for the following airports and runways:

Aircraft M/M/S	SIM FAA ID #	Airport	Approach Title	Landing Runway
TABL01	TABL02	TABL03	TABL04	TABL05

TEXT99

Sample operations specification C076, Category I IFR Landing Minimums - Contact Approaches.

The certificate holder shall not use any IFR Category I landing minimum lower than that prescribed by the applicable published instrument approach procedure. The IFR landing minimums prescribed in paragraphs C053 for nonprecision approaches and C074 for precision approaches of these operations specifications are the lowest Category I minimums authorized for use at any airport.

a. Contact Approaches. The certificate holder shall not conduct contact approaches, unless the pilot-in-command has satisfactorily completed an approved training program for contact approaches. In addition, the certificate holder shall not conduct a contact approach unless the approach is conducted to an airport with an approved instrument approach procedure for that airport, and all of the following conditions are met:

(1) The flight remains under instrument flight rules and is authorized by ATC to conduct a contact approach.

(2) The reported visibility/RVR for the runway of intended landing is at or above the authorized IFR minimum for the Category I nonprecision approach established for that runway or one statue mile (RVR 5000), whichever is higher.

(3) The flight is operating clear of clouds and can remain clear of clouds throughout the contact approach. The flight visibility must be sufficient for the pilot to see and avoid all obstacles and safely maneuver the aircraft to the landing runway using external visual references.

(4) The flight does not descend below the MEA/MSA, MVA, or the FAF altitude, as appropriate, until:

(a) The flight is established on the instrument approach procedure, operating below the reported ceiling, and the pilot has identified sufficient prominent landmarks to safely navigate the aircraft to the airport, or

(b) The flight is operating below any cloud base which constitutes a ceiling, the airport is in sight, and the pilot can maintain visual contact with the airport throughout the maneuver.

(5) The flight does not descend below the highest circling MDA prescribed for the runway of intended landing until the aircraft is in a position from which a descent to touchdown, within the touchdown zone, can be made at a normal rate of descent using normal maneuvers.

b. If Applicable, Special Limitations and Provisions for Instrument Approach Procedures at Foreign Airports.

(1) Foreign approach lighting systems equivalent to U.S. standards are authorized for precision and nonprecision instrument approaches. Sequenced flashing lights are not required when determining the equivalence of a foreign approach lighting system to U.S. standards.

(2) For straight-in landing minimums at foreign airports where an MDA(H) or DA(H) is not specified, the lowest authorized MDA(H) or DA(H) shall be obtained as follows:

(a) When an obstruction clearance limit (OCL) is specified, the authorized MDA(H) or DA(H) is the sum of the OCL and the touchdown zone elevation (TDZE). If the TDZE for a particular runway is not available, threshold elevation shall be used. If threshold elevation is not available, airport elevation shall be used. For approaches other than ILS, MLS, or GLS, the MDA(H) may be rounded to the next higher 10-foot increment.

(b) When an obstacle clearance altitude (OCA)/obstacle clearance height (OCH) is specified, the authorized MDA(H) or DA(H) is equal to the OCA/OCH. For approaches other than ILS, MLS, or GLS, the authorized MDA(H) may be expressed in intervals of 10 feet.

(c) The HAT or HAA used for precision approaches shall not be below those specified in subparagraph a of this operations specification.

(3) When only an OCL or an OCA/OCH is specified, visibility and/or RVR minimums appropriate to the authorized HAA/HAT values determined in accordance with subparagraph b(2) above will be established in accordance with criteria prescribed by U.S. TERPS or Joint Aviation Authorities (JAR-OPS1).

(4) When conducting an instrument approach procedure outside the United States, the certificate holder shall not operate an aircraft below the prescribed MDA(H) or continue an approach below the DA(H), unless the aircraft is in a position from which a normal approach to the runway of intended landing can be made and at least one of the following visual references is clearly visible to the pilot:

(a) Runway, runway markings, or runway lights.
(b) Approach lights.
(c) Threshold, threshold markings, or threshold lights.
(d) Touchdown zone, touchdown zone markings, or touchdown zone lights.
(e) Visual glide path indicator (such as, VASI, PAPI).
(f) Any other feature which clearly identifies the landing surface.

Sample operations specifications, C078, IFR Lower Than Standard Takeoff Minimums, 14 CFR Part 121 Airplane Operations - All Airports.

Standard takeoff minimums are defined in paragraph C056 of these operations specifications. The certificate holder is authorized to use lower than standard takeoff minimums under the following provisions and limitations. Runway visual range (RVR) reports, when available for a particular runway, shall be used for all takeoff operations on that runway. All takeoff operations, based on RVR, must use RVR reports from the locations along the runway specified in this paragraph.

a. When takeoff minimums are equal to or less than the applicable standard takeoff minimum, the certificate holder is authorized to use the lower than standard takeoff minimums described below:

(1) Visibility or runway visual value (RVV) 1/4 statute mile or touchdown zone RVR 1600, provided at least one of the following visual aids is available. The touchdown zone RVR report, if available, is controlling. The mid RVR report may be substituted for the touchdown zone RVR report if the touchdown zone RVR report is not available.

(a) Operative high intensity runway lights (HIRL).
(b) Operative runway centerline lights (CL).
(c) Runway centerline marking (RCLM).
(d) In circumstances when none of the above visual aids are available, visibility or RVV 1/4 statute mile may still be used, provided other runway markings or runway lighting provide pilots with adequate visual reference to continuously identify the takeoff surface and maintain directional control throughout the takeoff run.

(2) Touchdown zone RVR 1000 (beginning of takeoff run) and rollout RVR 1000, provided all of the following visual aids and RVR equipment are available. The mid RVR report may be substituted for the touchdown zone RVR report if the touchdown zone RVR report is not available.

(a) Operative runway centerline lights (CL).
(b) Two operative RVR reporting systems serving the runway to be used, both of which are required and controlling. A mid-RVR report may be substituted for either a touchdown zone RVR report if a touchdown zone report is not available or a rollout RVR report if a rollout RVR report is not available.
(3) Touchdown zone RVR 500 (beginning of takeoff run), mid RVR 500, and rollout RVR 500, provided all of the following visual aids and RVR equipment are available.

(a) Operative runway centerline lights (CL).
(b) Runway centerline markings (RCLM).
(c) Operative touchdown zone and rollout RVR reporting systems serving the runway to be used, both of which are controlling, or three RVR reporting systems serving the runway to be used, all of which are controlling. However, if one of the three RVR reporting systems has failed, a takeoff is authorized, provided the remaining two RVR values are at or above the appropriate takeoff minimum as listed in this subparagraph.

b. At foreign airports which have runway lighting systems equivalent to U.S. standards, takeoff is authorized with a reported touchdown zone RVR of 150 meters, mid RVR of 150 meters, and rollout RVR of 150 meters. At those airports where it has been determined that the runway lighting system is not equivalent to U.S. standards, the minimums in subparagraphs a(1) or (2), as appropriate, apply.

c. In circumstances when the touchdown zone RVR reporting system has failed, is inaccurate, or is not available, the certificate holder is authorized to substitute pilot assessment of equivalent RVR for any touchdown zone RVR report required by this operations specification paragraph provided that:

(1) The pilot has completed the approved training addressing pilot procedures to be used for visibility assessment in lieu of RVR, and
(2) Runway markings or runway lighting is available to provide adequate visual reference for the assessment.

d. Additional provisions for **takeoff guidance systems**--all airports, if applicable. Not withstanding the lower than standard takeoff minimums specified in subparagraph a of this operations specification, the certificate holder is authorized to use the takeoff minimums specified for the aircraft and airports listed in this subparagraph provided the special provisions and conditions described below are met. The certificate holder shall conduct no other takeoffs using these takeoff minimums.

(1) Special provisions and limitations.
(a) Operative runway centerline lights (CL)
(b) Operative high intensity runway lights (HIRL)
(c) Serviceable runway centerline markings (RCLM)
(d) Front course guidance from the localizer must be available and used (if applicable to guidance systems used)
(e) The reported crosswind component shall not exceed 10 knots.
(f) Operative touchdown zone, and rollout RVR reporting systems serving the runway to be used, both of which are controlling, or three RVR reporting systems serving the runway to be used, all of which are controlling. However, if one of the three RVR reporting systems has failed, a takeoff is authorized, provided the remaining two RVR values are at or above the appropriate takeoff minimum as listed in this subparagraph.
(g) The pilot-in-command and the second-in-command have completed the certificate holders approved training program for these operations.
(h) All operations using these minimums shall be conducted to runways which provide direct access to taxi routings which are equipped with: operative taxiway centerline lighting which meets U.S. or ICAO criteria for Category III operations; or other taxiway guidance systems approved for these operations.

(2) Authorized airplanes using takeoff guidance systems--all airports. The certificate holder is authorized to use the following takeoff minimums for the airplanes listed below. (if subparagraph d is not authorized, use N/A in the Airplane M/M/S column):

Airplane M/M/S	Lowest Authorized RVR	Required Takeoff Guidance System

1st Recommendation

FAA Action: See Task 3-Low Visibility Operations